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मानक

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IS 13703-2-2 (1993): Low-voltage fuses for voltages not exceeding 1 000 V AC or 1 500 V DC, Part 2: Fuses for use by authorized persons, Section 2: Examples of standardized fuses [ETD 39: Fuses]



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Bhartrhari—Nitiśatakam

“Knowledge is such a treasure which cannot be stolen”

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IS 13703 (Part 2/Sec 2) : 1993
IEC Pub 269-2-1 (1987)
(Reaffirmed 2004)

भारतीय मानक

1 000 वो ए सी अथवा 1 500 वो डी सी से अनधिक वोल्टता
के लिये अल्प वोल्टता फ्यूज — विशिष्ट

भाग 2 प्राधिकृत व्यक्तियों द्वारा उपयोग के लिये फ्यूज

अनुभाग 2 मानकीकृत फ्यूजों के उदाहरण

Indian Standard

LOW VOLTAGE FUSES FOR VOLTAGE NOT EXCEEDING 1 000 V AC OR 1 500 V DC — SPECIFICATION

PART 2 FUSES FOR USE BY AUTHORIZED PERSONS

Section 2 Examples of Standardized Fuses

UDC 621.316.923.027.3

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BUREAU OF INDIAN STANDARDS
MANAK BHAVAN, 9 BAHADUR SHAH ZAFAR MARG
NEW DELHI 110002

June 1993

Price Group 14

Indian Standard

LOW VOLTAGE FUSES FOR VOLTAGE NOT EXCEEDING 1 000 V AC OR 1 500 V DC — SPECIFICATION

PART 2 FUSES FOR USE BY AUTHORIZED PERSONS

Section 2 Examples of Standardized Fuses

NATIONAL FOREWORD

This Indian Standard (Part 2/Sec 2) which is identical with IEC Pub 269-2-1 issued by the International Electrotechnical Commission (IEC) is being brought out to align the standardized designs of industrial fuses with the corresponding designs at the IEC level.

The text of the IEC standard has been considered and approved by ETD 39, Fuses Sectional Committee of BIS as suitable for publication as Indian Standard. This Section together with Section 1 of this part supersedes IS 9224 (Part 2).

CROSS REFERENCES

The Technical Committee responsible for the preparation of this standard has decided that IEC Pub 685-2-2 (1983) quoted in this standard is acceptable for use with this Indian Standard.

NATIONAL ANNEX

Keeping in view the use of this standard in Indian conditions, the technical committee responsible for this standard has felt the need to provide elaboration and interpretation where felt necessary. These are summarized in a national annex. The text of this standard shall be read in conjunction with this annex which is an integral part of it.

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EXPLANATORY NOTE

In view of the fact that this standard should be read together with IEC Publications 269-1 and 269-2 the numbering of its clauses and sub-clauses are made to correspond to these publications. Regarding the tables, their numbering also corresponds to that of IEC Publication 269-1; however, when additional tables appear they are referred to by capital letters, for example, Table A, Table B, etc.

1. General

Fuses for use by authorized persons according to the following sections shall also comply with all sub-clauses of:

IEC Publication 269-1: Low-voltage fuses, Part 1: General requirements, and

IEC Publication 269-2: Low-voltage fuses, Part 2: Supplementary requirements for fuses for use by authorized persons (fuses mainly for industrial applications).

This standard is divided into three sections, each dealing with a specific example of standardized fuse for use by authorized persons:

Section I: Fuses with fuse-links with blade contacts.

Section II: Fuses with fuse-links for bolted connections.

Section III: Fuses with fuse-links having cylindrical contact caps.

Note. — The following fuse systems are standardized systems in respect to their safety aspects. The National Committees may select from the examples of standardized fuses one or more systems for their own standards.

SECTION I: FUSES WITH FUSE-LINKS WITH BLADE CONTACTS

1.1 Scope

The following additional requirements apply to fuses with fuse-links having blade contacts intended to be replaced by means of a device, for example replacement handle, which complies with the dimensions specified in Figures 1(I*) and 2(I*), pages 28 and 30. Such fuses have rated currents up to and including 1 250 A and rated voltages up to and including 660 V a.c. or 440 V d.c.

5.2 Rated voltage

For a.c. the standard values of rated voltage are 500 V or 660 V. For d.c. the rated voltage is 440 V.

5.3.1 Rated current of the fuse-link

For each size the maximum rated currents are given in Figure 1(I). These values depend upon the utilization categories and rated voltages.

* Refers to Section I.

5.3.2 Rated current of the fuse-holder

The rated current for the different sizes of the fuse-bases is given in Figure 2(I), page 30.

5.5 Rated power dissipation of a fuse-link and rated power acceptance of a fuse-holder

The maximum values of rated power dissipation for the different sizes of fuse-links are specified in Figure 1(I). The values apply to the maximum rated currents of the fuse-links. The values of rated power acceptance of fuse-bases are given in Figure 2(I).

5.6 Limits of time-current characteristics

5.6.1 Time-current characteristics, time-current zones and overload curves

The tolerance on time-current characteristics given by the manufacturer shall not deviate by more than $\pm 10\%$ in terms of current. The time-current zones given in Figures 4(I), page 33, including manufacturing tolerances shall be met by all pre-arcing and total times measured at the test voltage according to Sub-clause 8.7.4.

5.6.2 Conventional times and currents

The conventional times and currents, in addition to the values of IEC Publication 269-1, are given in Table II.

TABLE II
Conventional time and current for "gG" fuse-links with rated current lower than 16 A

Rated current I_n (A)	Conventional time (h)	Conventional current	
		I_{nf}	I_f
$I_n \leq 4$	1	$1.5 I_n$	$2.1 I_n$
$4 < I_n < 16$	1	$1.5 I_n$	$1.9 I_n$

5.6.3 Gates

For "gG" fuse-links the gates given in Table III apply, in addition to the gates of IEC Publication 269-1.

TABLE III
Gates for specified pre-arcing and operating times of "gG" fuse-links with rated current $< 16 A$

I_n (A)	I_{min} (10 s) (A)	I_{max} (5 s) (A)	I_{min} (0.1 s) (A)	I_{max} (0.1 s) (A)
2	3.7	9.2	6.0	23.0
4	7.8	18.5	14.0	47.0
6	11.0	28.0	26.0	72.0
8	16.0	35.2	41.6	92.0
10	22.0	46.5	58.0	110.0
12	24.0	55.2	69.6	140.4

6. Marking

Fuse-links and fuse-holders which meet the requirements and tests of Section I of this standard may be marked with 269-2-1.

6.1 Markings of fuse-holders

The marking of the rated current and the rated voltage shall be discernible from the front when a fuse-link has not been fitted.

6.2 Markings of fuse-links

The marking of the rated current and the rated voltage shall be discernible from the front. Fuse-links with a rated voltage of 660 V shall be clearly marked, for example, by a strip which extends across the middle part of the fuse markings. In this example ~ 660 V shall be marked on this strip in bright print.

7.1 Mechanical design

The dimensions of fuse-links and fuse-bases are given in Figures 1(I) and 2(I).

7.1.2 Connections including terminals

There are different kinds of terminals. As far as lug-terminals are concerned the range of cross-sections which the terminals shall be capable of accepting results from the following ranges of rated currents of fuse-links of each size.

Terminals designed for unprepared conductors shall be capable of accepting as a minimum, conductors with the cross-sectional ranges given in Table D. In case the terminal is a lug-terminal (see IEC Publication 685-2-2) the torques which shall be applied are given in Table F. Values for other terminals are under consideration.

TABLE D
Minimum cross-sectional ranges of conductors

Size	Range of rated currents of the fuse-links (A)	Cross-sectional area ranges (mm ²)
00	6 to 160	10 to 70
0	6 to 160	10 to 70
1	80 to 250	70 to 120
2	125 to 400	95 to 240
3	315 to 630	no values available
4	500 to 1 000	
4a	500 to 1 250	

Connections of larger and/or smaller cross-sectional areas may be necessary. This can be achieved either by the construction of the terminal or by additional means of connections as recommended by the manufacturer.

Table D covers terminals designed for copper conductors. If the terminals are suitable for aluminium or copper and aluminium, it shall be marked accordingly.

7.1.3 Fuse-contacts

The contact surfaces of fuse-links and fuse bases should be silver-plated, otherwise it shall be verified that contacting is not impaired in normal operation. The requirements for fuse contacts will be verified by the tests given in Sub-clause 8.10 of IEC Publication 269-1.

7.1.7 Construction of a fuse-link

The preferred construction is as follows: the blade contacts shall be made of solid material. If any other construction of blade contacts is used the manufacturer has to demonstrate that this construction is adequate for the purpose.

With the exception of the attachment for the replacement handle the endplates are not permitted to protrude radially from the insulation body. For some applications it is preferable to insulate the gripping lugs from live parts.

Fuse-links shall have an indicator.

7.7 I^2t characteristics

For the fuse-links covered by this section the maximum pre-arcing I^2t values given in Table VI of IEC Publication 269-1 apply for the maximum operating I^2t values. Values for rated currents lower than 16 A are given below in Table VI.

TABLE VI
Pre-arcing and operating I^2t values at 0.01 s for "gG" fuse-links

I_n (A)	I^2t_{min} (A ² s)	I^2t_{max} (A ² s)
2	1.00	23.00
4	6.25	90.25
6	24.00	225.00
8	49.00	420.00
10	100.00	576.00
12	420.00	1 150.00

7.8 Overcurrent discrimination of "gG" fuse-links

Fuse-links in series with rated current ratio of 1:1.6 and rated currents 16 A and above have to discriminate up to the values specified in Sub-clause 8.7.4.

With regard to discrimination when circuit-breakers are used the following I^2t – values in Table E have to be followed.

TABLE E
 I^2t -pre-arcing values for discrimination

I_n (A)	I^2t_{min} (A ² s)	at I_p (A)
16	250	500
20	450	670
25	810	900
32	1 400	1 180
40	2 500	1 580
50	4 000	2 000
63	6 300	2 510
80	10 000	3 160
100	16 000	4 000
125	24 000	4 900
160	42 500	6 520
200	78 000	8 830

7.9 Protection against electric shock

The protection against electric shock can be increased by means of partition walls and covers of the fuse-contacts.

8.1.6 Testing of fuse-holders

In addition to the test given in IEC Publication 269-1, the fuse-holders shall be subjected to the tests according to Table VIII.

TABLE VIII

Survey of tests on fuse-holders and number of fuse-holders to be tested

Test according to Sub-clause		Number of fuse-holders				
		1	1	1	1	1
8.5.5.1	Verification of the peak withstand current of a fuse-base				×	×
8.9	Verification of resistance to heat			×		
8.11.1.2	Mechanical strength of the fuse-base	×	×	×	×	
8.11.2.4	Non-deterioration of insulating parts of fuse-link and fuse base	×	×			

8.3 Verification of temperature rise and power dissipation

8.3.1 Arrangement of the fuse

The screws or nuts of the terminals are to be fastened by applying a torque which is given in Table F.

TABLE F

Torque to be applied to the terminal screws

I_n (A)	Size	Size of screws	Torque (Nm)
160	00	M8	10
160	0	M8	10
250	1	M10	32
400	2	M10	32
630	3	M10/M12	32/56
1 000	4	M12	56
1 250	4a	2×M12/M16	56

Note. — Values of torques for applying to terminal screws are under consideration.

8.3.4.1 Temperature rise of the fuse-holder

The dummy is given in Figure 5(I), page 35. The point at which the temperature rise is measured is marked with E in Figure 6(I), page 36.

8.3.4.2 Power dissipation of a fuse-link

The points between which the power dissipation of a fuse-link is measured are marked with S in Figure 6(I).

8.5.5.1 Verification of the peak withstand current of a fuse-base

The verification of the peak withstand current of a fuse-base need not be carried out, if this has already been verified during the breaking capacity test of the fuse-links with the highest rating of the size.

8.5.5.1.1 Arrangement of the fuse

The test shall be of the single-phase type. The test set-up for the fuse-base shall be in line with Sub-clause 8.5.1 of IEC Publication 269-1.

The current shall be limited by a fuse-link of the highest rating for the particular size. The peak values of the test-currents attained must lie in the ranges shown in Table G.

TABLE G
Test currents

Size	Test currents (kA)
00	22...24
0	22...24
1	34...37
2	44...48
3	65...70

The maximum values may be exceeded as long as the requirements stated under Sub-clause 8.5.5.1.3 are met.

If the cut-off current range cannot be attained with the highest rating of the size, correspondingly higher series connected fuse shall be used. In this case the test specimen shall be equipped with a dummy fuse-link. Its external dimensions correspond to the dimensions given in Figure 5(I).

8.5.5.1.2 Test method

The test shall be performed on two fuse-bases. In the case of fuse-base 1, a hardened and polished test knife of steel, shown in Figure 7(I), page 36, shall be inserted by hand in order to open up the contacts to a certain extent. The purpose of this test is to ensure that the resilient spring travel is limited to the elastic range. The contacts shall be opened up three times. This test will be dispensed with if a mechanical stop limits the gap to less than 7 mm so that the test-blade cannot be correctly fitted by hand. Fuse-base 2 is tested in accordance with Sub-clause 8.11.1.1. The values of F_{max} according to Table J shall be adhered to. After these pre-tests the above-mentioned current test shall be performed.

8.5.5.1.3 Acceptability of test results

The fuse-links shall not be ejected. There shall be no signs of arcing or welding or other damage likely to prevent further use of the fuse-bases. Current marks on the contacts are permissible.

8.7.4 Verification of overcurrent discrimination

The overcurrent discrimination for fuses with rated current up to 12 A and the overcurrent discrimination ratio of 1:1.6 for fuses with rated currents higher than 12 A is verified by the I^2t values evaluated from the recorded test results.

The samples are arranged as for the breaking capacity test according to Sub-clause 8.5 and Table XI A of IEC Publication 269-1 regarding the test circuit and tolerance of current.

Four samples are tested, two samples are tested at the r.m.s. prospective test current I , corresponding to the minimum pre-arcing I^2t values, the other samples at the r.m.s. prospective test current I , corresponding to the operating I^2t values.

The test voltage is $1.1 \frac{U_n}{\sqrt{3}}$

TABLE H
Test currents and I^2t limits for discrimination test

I_n (A)	Minimum pre-arcing I^2t		Maximum operating I^2t		Discrimination ratio
	Prospective I (kA) r.m.s.	I^2t (A ² s)	Prospective I (kA) r.m.s.	I^2t (A ² s)	
2	0.013	0.67	0.064	16.4	Can be calculated
4	0.035	4.90	0.130	67.6	
6	0.064	16.40	0.220	193.6	
8	0.100	40.00	0.310	390.0	
10	0.130	67.60	0.400	640.0	
12	0.180	130.00	0.450	820.0	
16	0.270	291.00	0.550	1 210.0	1:1.6
20	0.400	640.00	0.790	2 500.0	
25	0.550	1 210.00	1.000	4 000.0	
32	0.790	2 500.00	1.200	5 750.0	
40	1.000	4 000.00	1.500	9 000.0	
50	1.200	5 750.00	1.850	13 700.0	
63	1.500	9 000.00	2.300	21 200.0	
80	1.850	13 700.00	3.000	36 000.0	
100	2.300	21 200.00	4.000	64 000.0	
125	3.000	36 000.00	5.100	104 000.0	
160	4.000	64 000.00	6.800	185 000.0	
200	5.100	104 000.00	8.700	302 000.0	
250	6.800	185 000.00	11.800	557 000.0	
315	8.700	302 000.00	15.000	900 000.0	
400	11.800	557 000.00	20.000	1 600 000.0	
500	15.000	900 000.00	26.000	2 700 000.0	
630	20.000	1 600 000.00	37.000	5 470 000.0	
800	26.000	2 700 000.00	50.000	10 000 000.0	
1 000	37.000	5 470 000.00	66.000	17 400 000.0	
1 250	50.000	10 000 000.00	90.000	33 100 000.0	

The evaluated I^2t values shall lie within the corresponding I^2t limits specified in Table H.

8.9 Verification of resistance to heat

These tests apply to fuse-links and fuse-bases.

8.9.1 Fuse-base

The test given below should be applied if it is not obvious that the components are not affected adversely by the given temperature and withdrawal forces.

8.9.1.1 Test arrangement

A dummy fuse-link according to Figure 5(I), page 35, is fitted into a fuse-base and also suspended from a measuring device as shown, for example, in Figure 8(I), page 37. The manner in which the dummy is fitted and secured (e.g. by locking pins), in fuse-bases shall ensure that heat dissipation is not seriously affected. The conductor cross-section depends upon the rated current (see IEC Publication 269-1, Table X), and the connections outside the heating chamber must be at least 1 m long. The test set-up is installed in such a heating chamber or below a heatable cowl of at least 50 l capacity, care being taken to see that the bushings etc. for the measuring facility and connections are suitably sealed. The heaters shall be such as to ensure that during the test sequence described below a temperature of $(80 \pm 5)^\circ\text{C}$ is

maintained with or without the test current, the temperature being measured at a horizontal distance of 150 mm from the dummy centre point.

8.9.1.2 *Test method*

The temperature in the heating chamber is raised to $(80^{+5}_0)^{\circ}\text{C}$, and maintained for 2 h. The dummy is then loaded with approximately 160% rated current with a tolerance of $\pm 2\%$ for 2 h. The test may be carried out at reduced voltage.

After loading and 3 min after switching off, a tensile force F_{max} (see Table J) is applied smoothly to the dummy. The force F_{max} is exerted for a period of 15 s.

8.9.1.3 *Acceptability of test results*

After this test the contact pieces of the fuse-base shall not have moved to such an extent as to affect the further use of the fuse-base. After pulling out of the dummy the dimensions of Figure 2(I), page 30, are to be considered. The insulating mounting part of the fuse-base shall neither be broken nor shall it show any signs of cracks.

8.9.2 *Fuse-links with gripping lugs of moulded material or of metal fixed in moulded material*

8.9.2.1 *Test arrangement*

A fuse-link of the highest rating for a size is fitted into a fuse-base, it shall be arrested there and also suspended from a measuring device as shown in Figure 8(I).

8.9.2.2 *Test method*

The temperature in the heating chamber is raised to $(80^{+5}_0)^{\circ}\text{C}$ and maintained for 2 h. The fuse-link is then loaded with 150% rated current until it blows, but the test is restricted to the conventional time. A reduced test voltage may be used. Three minutes after the fuse-link has blown or the conventional testing time has expired, a tensile force F_{max} (see Table J) is applied smoothly to the gripping lugs. The force is exerted for a period of about 15 s.

8.9.2.3 *Acceptability of test results*

The gripping lugs shall remain fully operational, and the length of the neck $(2.5^{+0.5}_0)$ mm, in particular shall not be exceeded by more than 2 mm, in keeping with the dimensions d of Figure 1(I), page 28. The same applies to the maximum values of dimension c_1 .

8.11 *Mechanical and miscellaneous tests*

8.11.1.2 *Mechanical strength of the fuse-base*

The mechanical strength of the fuse-bases and their components is verified by the following tests.

The test to verify the contact force of fuse-bases is performed with three unused fuse-bases as supplied. A test-link made of hardened steel with polished and chrome-plated surfaces is inserted three times in the fuse-base. The dimensions of the blade contacts of the fuse-link are identical with the dimensions according to Figure 1(I).

When pulling steadily by means of suitable test equipment, the withdrawal force F measured (see Figure 8(I)) shall be found to lie within the limits as specified in Table J.

TABLE J
*Force to withdraw the fuse-link from the
fuse-base contacts*

Size	Withdrawal force	
	$F_{\min}$ (N)	$F_{\max}$ (N)
00	60	250
0	80	300
1	110	350
2	150	400
3	210	400

In order to verify that the fuse-base contacts are firmly seated, steel screws (class 8.8) are fastened at the terminals. They are fastened three times by applying a torque which is 1.2 times the torque as specified in Table F. For flat connections requiring a nut, steps shall be taken to prevent, by suitable means, the nut from turning round.

After this test the contact pieces of the fuse-base shall not have moved to such an extent as to affect the further use of the fuse-base. The insulating mounting part of the fuse-base shall neither be broken nor shall it show any signs of cracks.

8.11.1.8 *Impact resistance of gripping-lugs of moulded material or of metal fixed in moulded material*

8.11.1.8.1 *Test arrangement*

The facility to verify impact resistance is given in Figure 9(I), page 38. The weight of the drop hammer is 300 g, the height of fall between the impact-mandrel and the gripping-lug is 300 mm.

8.11.1.8.2 *Test method*

One fuse-link is exposed to $(150 \pm 5)^\circ\text{C}$ for 168 h and another one to -15°C for 72 h. The fuse-link exposed to heat is to be cooled off to room temperature before being subjected to the dynamic stress. For the sample exposed to cooling the time interval between the taking out and the dynamic stress shall not be longer than 1 min.

The samples are placed in the test facility of Figure 9(I) in such a way that the direction of the stroke is parallel to the longitudinal axis of the fuse-link. Each of the gripping-lugs is only once exposed to stress at which the place of impact shall be the middle of the gripping-lug-neck. It shall be guaranteed that each time only the upper gripping-lug is stressed by the impact.

8.11.1.8.3 *Acceptability of test results*

The gripping-lugs shall show no damage capable of hindering their further use. Each of the gripping-lugs shall not be bent out by more than 3 mm measured before and after the impact; furthermore the coupling with a handle according to Figure 3(I), page 32, shall not be hindered.

8.11.2.4 *Non-deterioration of insulating parts of fuse-link and fuse-base*

8.11.2.4.1 *Test method*

Three fuse-links and three fuse-bases to be tested shall be exposed to the following temperatures:

for a period of 168 h

$(150 \pm 5)^\circ\text{C}$ for equipment comprising moulded elements intended to support live parts,

$(100 \pm 5)^\circ\text{C}$ for covers,

for a period greater than 1 h

$(150 \pm 5)^\circ\text{C}$ over 1 h for sealing compounds; stability of the marking.

After cooling to ambient temperature the following shall be tested:

Fuse-links: verification of the breaking capacity with I_1 and I_2 in accordance with Sub-clause 8.5 of IEC Publication 269-1,

Fuse-base: verification of the mechanical strength in accordance with Sub-clause 8.11.1.2.

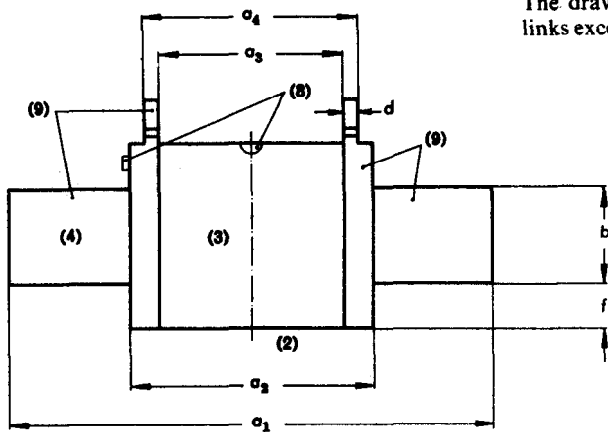
8.11.2.4.2 *Acceptability of test results*

The positions of the fuse-base contacts taking the fuse-link shall not have changed in a manner likely to affect its correct functioning. The insulating body on which the terminals are fixed shall neither fracture nor show any signs of a fracture. The mechanical strength of cemented joints shall not have been impaired. Sealing compounds shall not have shifted to an extent permitting live parts to be exposed. The fuse-links shall operate correctly.

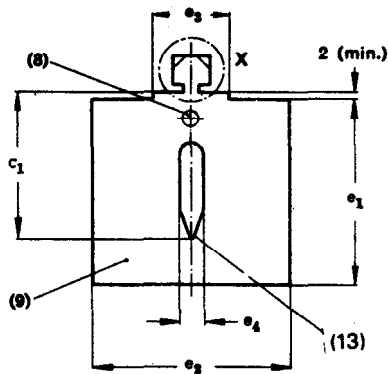
The marking shall be durable and easily legible.

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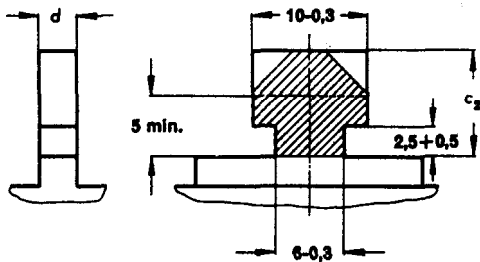
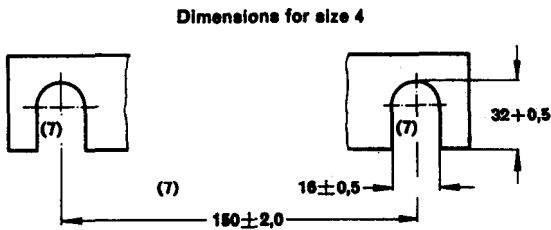
Dimensions in millimetres



The drawings are not intended to govern the design of fuse-links except as regards the notes and dimensions shown.



DETAIL X (5)



Maximum permissible power dissipation

Size	gG				aM			
	AC 500 V		AC 660 V		AC 500 V		AC 660 V	
	I_n (A)	P_n (W)	I_n (A)	P_n (W)	I_n (A)	P_n (W)	I_n (A)	P_n (W)
00	100/160	7,5/12	100	12	100	7,5	160	12
0	160	16	100	25	160	16	160	25
1	250	23	200	32	250	23	250	32
2	400	34	315	45	400	34	400	45
3	630	48	500	60	630	48	630	60
4	1 000	90	800	90	1 000	90	1 000	90
4a	1 250	110	1 000	110	1 250	110	1 250	110

FIG. 1(I*). — Fuse-links with blade contacts. (Figure continued)

* Refers to Section II.

(14)

(11)

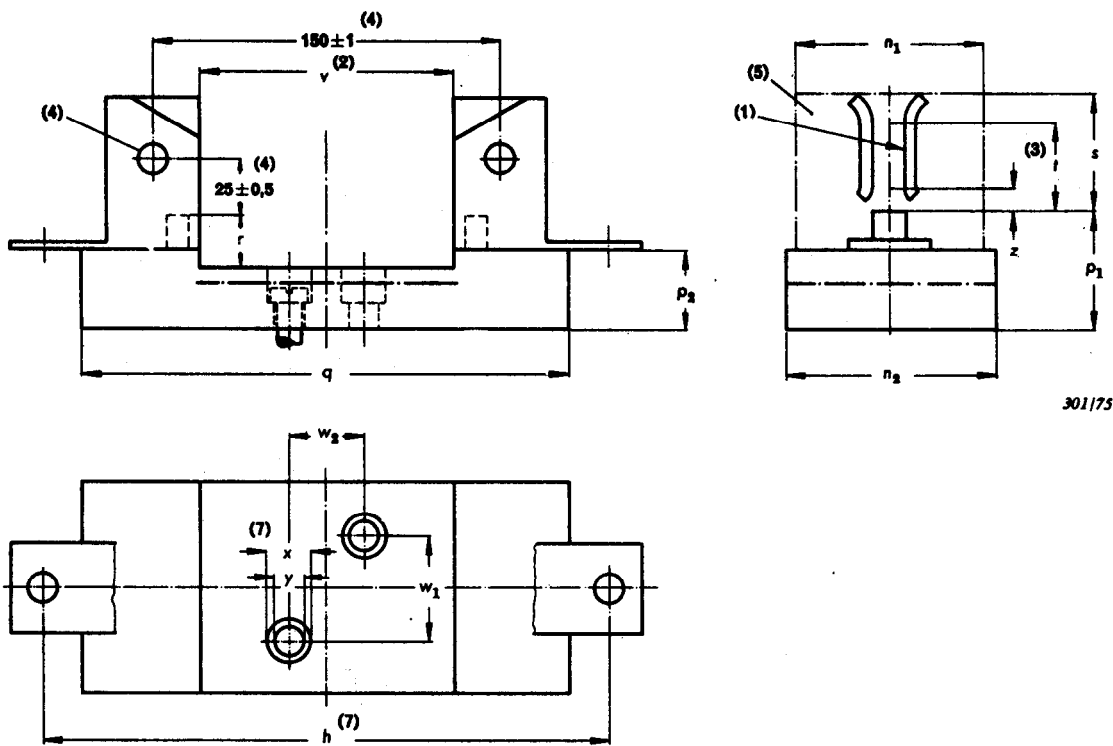
Size	a_1 (1)	a_2 (2)	a_3 (1)	a_4 (1)	b (min.) (12)	c_1 $\pm 0,8$	c_2	d (5)	e_1 (max.) (6)	e_2 (max.) (6)	e_3	e_4 $\pm 0,2$	f (max.)
00	$78,5 \pm 1,5$	54-6	$45 \pm 1,5$	$49 \pm 1,5$	15	35	10-1	$2^{+1,0}_{-0,5}$	48	30	20 ± 5	6	15
0	$125 \pm 2,5$	68-8	$62^{+3}_{-1,5}$	$68^{+1,5}_{-3}$	15	35	11-2	$2^{+1,5}_{-0,5}$	48	40	20 ± 5	6	15
1	$135 \pm 2,5$	75-10	$62 \pm 2,5$	$68 \pm 2,5$	20	40	11-2	$2,5^{+1,5}_{-0,5}$	53	52	20^{+5}_{-2}	6	15
2	$150 \pm 2,5$	75-10	$62 \pm 2,5$	$68 \pm 2,5$	25	48	11-2	$2,5^{+1,5}_{-0,5}$	61	60	20^{+5}_{-2}	6	15
3	$150 \pm 2,5$	75-10	$62 \pm 2,5$	$68 \pm 2,5$	32	60	11-2	$2,5^{+1,5}_{-0,5}$	76	75	20^{+5}_{-2}	6	18
4(7)	200 ± 3	90 max.	$62 \pm 2,5$	$68 \pm 2,5$	49	87	11-2	$2,5^{+1,5}_{-0,5}$	110	105	20^{+5}_{-2}	8	25
4a	200 ± 3	100 max.	84 ± 3	90 ± 3	49	85 ± 2	11-2	$2,5^{+1,5}_{-0,5}$	110	102	30 ± 10	6	30

Notes:

- (1) The centres of the dimensions a_1 , a_3 and a_4 shall not deviate from the centre of a_2 by more than 1.5 mm.
- (2) The dimension a_2 shall be observed within the total area $b_{min.}/2$, measured from the lower edge of the blade, over a width of at least 4 mm on both sides of the blade. Outside this area, the dimension may be less than the values indicated for a_2 .
- (3) Insulating material.
- (4) The contact surfaces may be plane or provided with ribs.
- (5) Attachment for replacement handle (detail X).
- (6) Maximum dimensions of the enclosure of the fuse-link. Within these limits, the fuse-links may be of any form, for example, square, rectangular, circular, oval, polygonal, etc.
- (7) The slots are mandatory for size 4 fuse-links.
- (8) Indicating device. Position of the indicating device as chosen by the manufacturer.
- (9) Live parts, gripping-lugs can be insulated.
- (10) With the exception of the attachment for the replacement handle (detail X), the endplates are not permitted to protrude radially from the insulation body.
- (11) Only to be used with a swivel unit having an interlocking device.
- (12) As far as overlapping of rated currents exists within the sizes 0, 1, 2 and 3 the dimension of the smaller size is permitted.
- (13) The edge of blade contacts can be round or of any appropriate shape.
- (14) A new size 000 (formerly C00) is at present under consideration.
The following dimensions are recommended for the fuse-links:
 $e_{1\max} = 41\text{ mm}$ $e_{3\max} = 16^{+5}_{-2}\text{ mm}$
 $e_{2\max} = 21\text{ mm}$ $f_{\max} = 8\text{ mm}$
Other dimensions are those as for size 00.

FIG. 1(I). — (Concluded)

Dimensions in millimetres



The drawings are not intended to govern the design of fuse-links except as regards the notes and dimensions shown.

Size	h $\pm 1,5$ (7)	n_1 (max.)	n_2 (max.)	p_1 (max.)	p_2 $\pm 1,5$	r (min.)	s (max.)	t (min.)	v	w_1 (7)	w_2 (7)	x (min.) (7)	y $\pm 0,5$ (7)	z (max.)
00	100	30	38	40	—	17	21	15	$56,5 \pm 1,5$	$0 \pm 0,7$	$25 \pm 0,7$	14	7,5	3
0	150	40	48	48	—	17	25	15	74 ± 3	$0 \pm 0,7$	$25 \pm 0,7$	14	7,5	3
1	175	52	60	55	35	17	38	21	80 ± 3	$30 \pm 0,7$	$25 \pm 0,7$	20	10,5	5
2	200	60	68	60	35	17	46	27	80 ± 3	$30 \pm 0,7$	$25 \pm 0,7$	20	10,5	5
3	210	75	83	68	35	20	58	33	80 ± 3	$30 \pm 0,7$	$25 \pm 0,7$	20	10,5	5
4	—	—	—	—	—	27	84	50	97(min.)	—	—	—	—	5
(6) 4a	270	102	115	—	40	32	84	50	110 ± 15	$45 \pm 0,7$	$30 \pm 0,7$	36	14	6

FIG. 2(I). — Fuse-bases for fuse-links with blade contacts. (Figure continued)

Size	Rated current (A)	Rated power acceptance (W)
00	160	12
0	160	25
1	250	32
2	400	45
3	630	60
4	1 000	90
4a	1 250	110

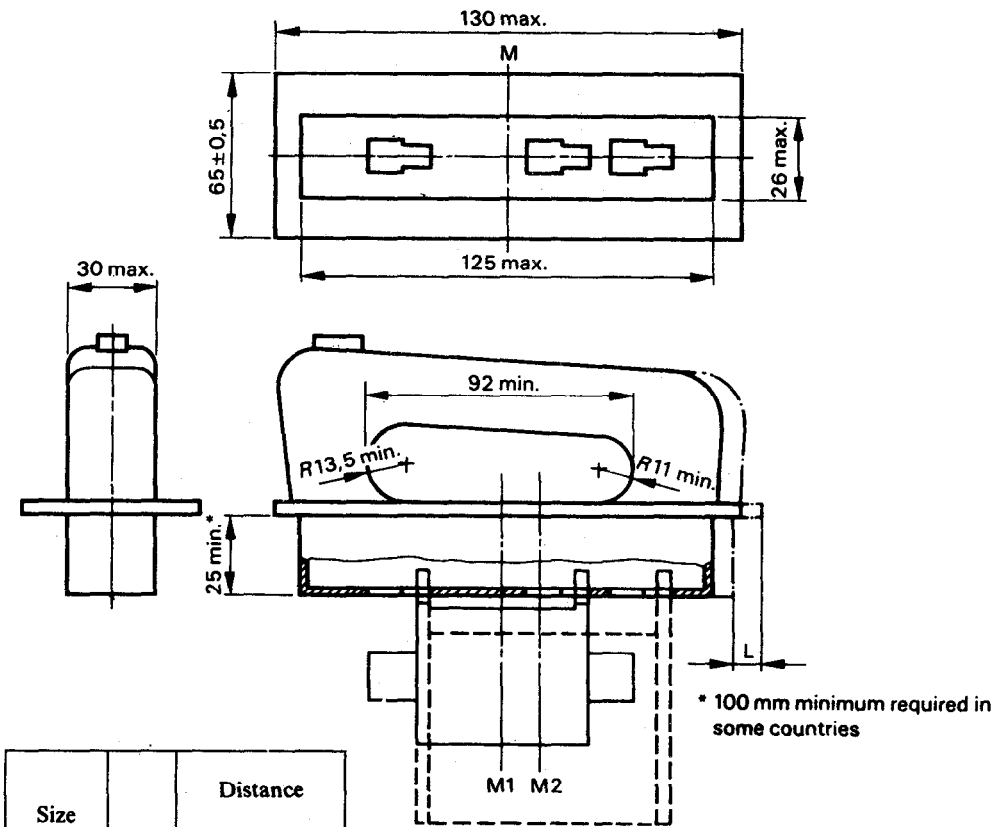
Notes:

- (1) This area is considered to be live.
- (2) The maximum value of dimension v is intended to define a point of contact. It shall be observed at least at one point of contact within the range of $b_{\min}/2$, measured from the lower edge of the blade contact of the fuse-link. At the upper edge of the blade contact, the value of v need not be observed.
- (3) Height of contact surface. It shall also be possible to insert fuse-links with blade contacts according to Figure 1(I), page 28, even if the contact surface is not smooth but grooved or divided.
- (4) Dimensions for size 4. Fixing bolts are mandatory for size 4; M12 when threaded.
- (5) Resilient contact surface, except for size 4. Contact force by auxiliary means.
- (6) Only to be used with a swivel unit having an interlocking device.
- (7) These values are only mandatory if interchangeability of fuse-bases is required.
- (8) When constructing multipole or assemblies of single pole fuse-bases, it is necessary for reason of safety to fit insulating barriers (e.g. partition walls) compatible with the maximum dimension prescribed for n_1 .

FIGURE 2(I). — (Concluded)

Dimensions in millimetres

The drawings are not intended to govern the design of the handle except as regards the notes and dimensions shown.



Centre of the set in and blocked up fuse-link:
M1 for size 00
M2 for sizes 0...3
M = Centre of the coupling
L = Permitted lift for setting in and taking out of the fuse-link

FIG. 3(I). — Replacement handle.

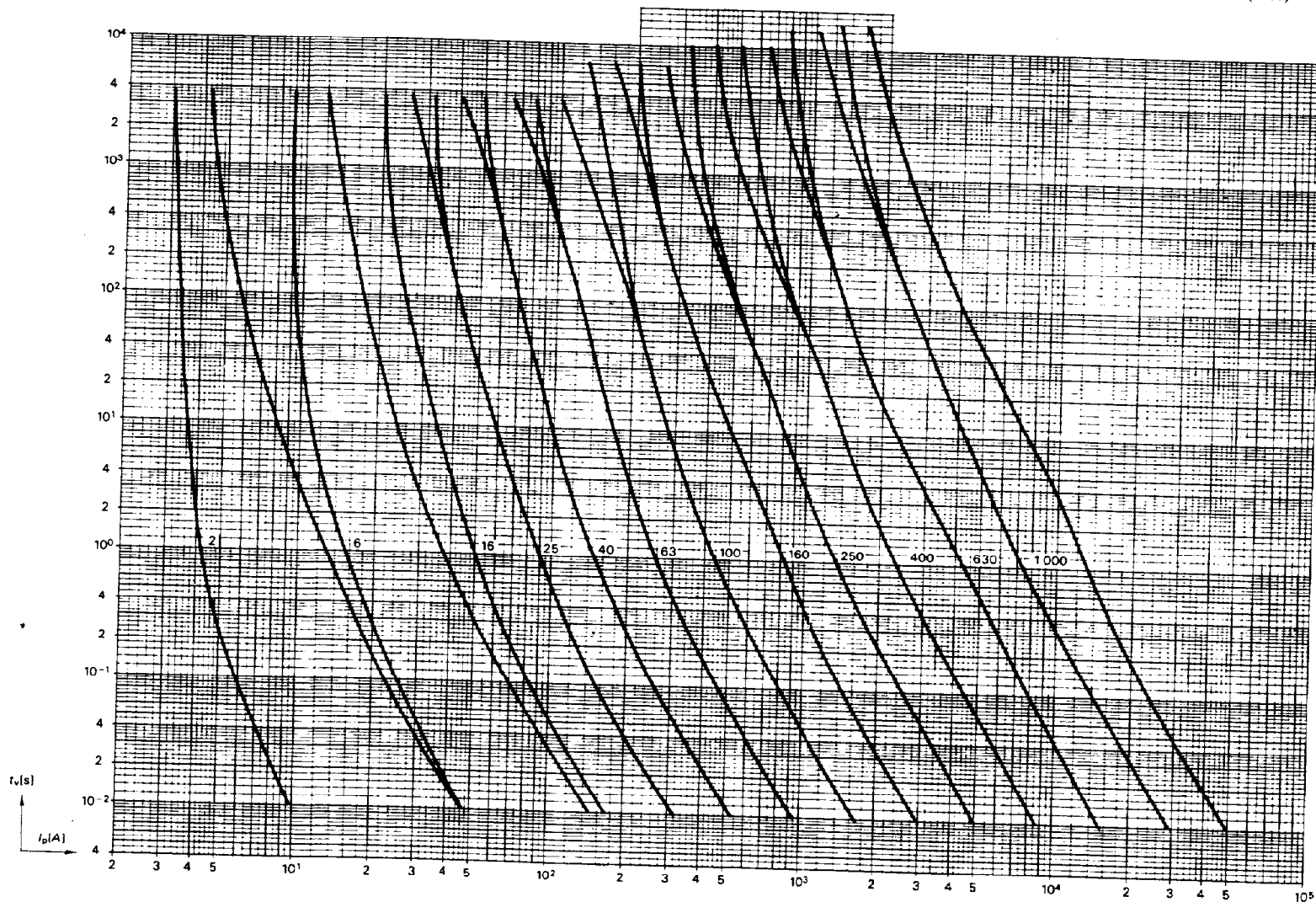


FIG. 4(I). — Time-current zones for "gG" fuse-link. (Figure continued)

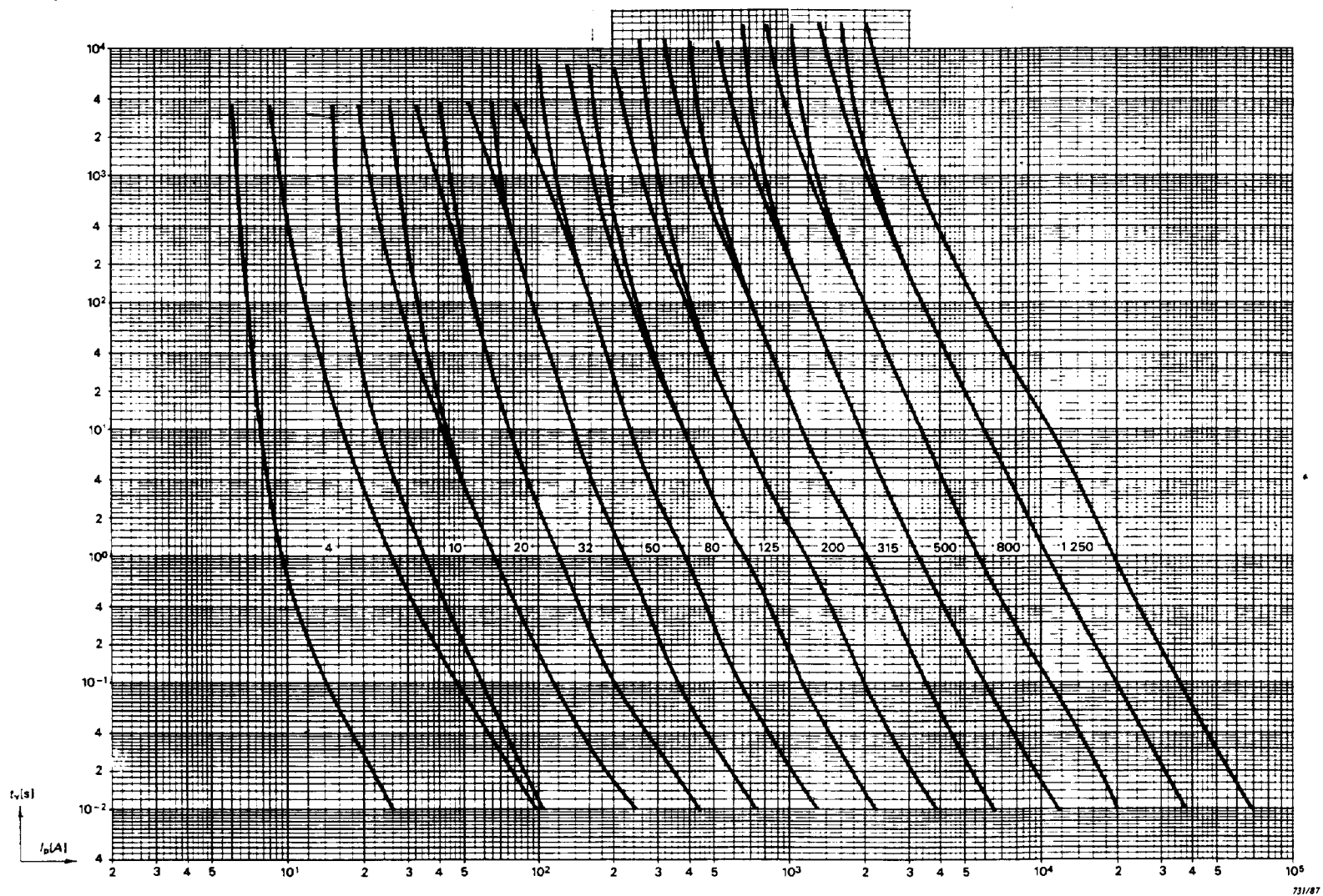
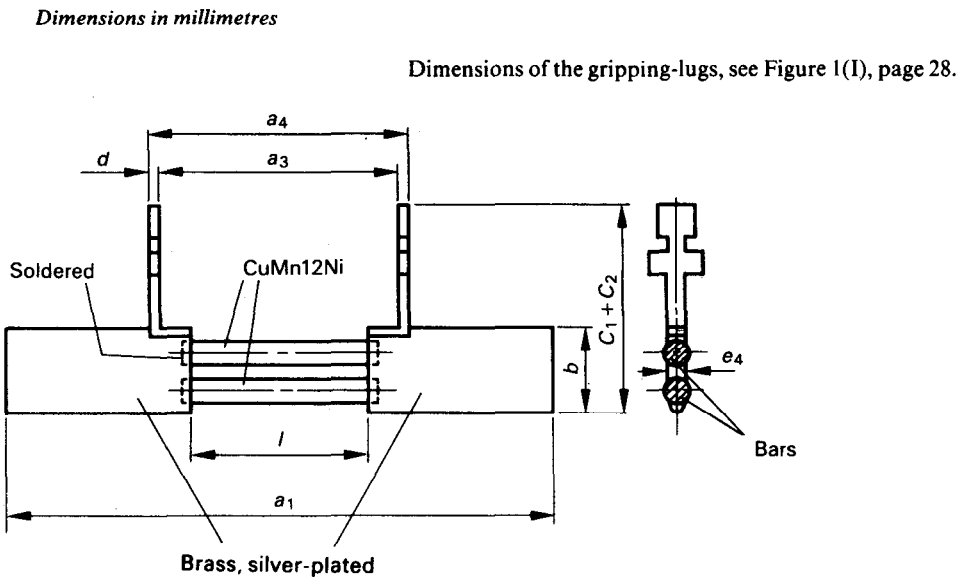


FIG. 4(1). — (Concluded)



Other dimensions, see Figure 1 (I) continued.

Faitle Size	b	P* W	R** mΩ	Barres Bars	
				Nombre Number	Diamètre Diameter
00	30,5 ⁰ ₋₃	12	0,47	1	7
0	46 ⁰ ₋₄	25	0,97	1	6
1	46 ⁰ ₋₄	32	0,51	1	8
2	46 ⁰ ₋₄	45	0,281	2	8
3	46 ⁰ ₋₄	60	0,151	3	9
4	54 ⁰ ₋₆	90	0,09	3	12
4a	54 ⁰ ₋₆	110	0,07	4	12

* At the largest rated current of the size

** Measured at the gripping lugs; equalized with a tolerance of ± 2%

FIG. 5(I). — Dummy fuse-link according to Sub-clauses 8.3.4.1, 8.5.5.1, 8.9.1 and Sub-clause 8.10 of IEC Publication 269-1.

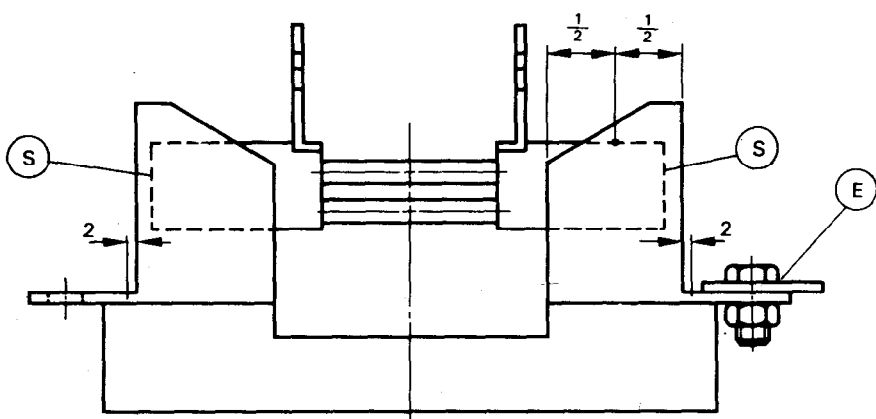
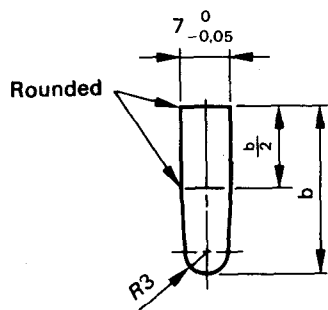


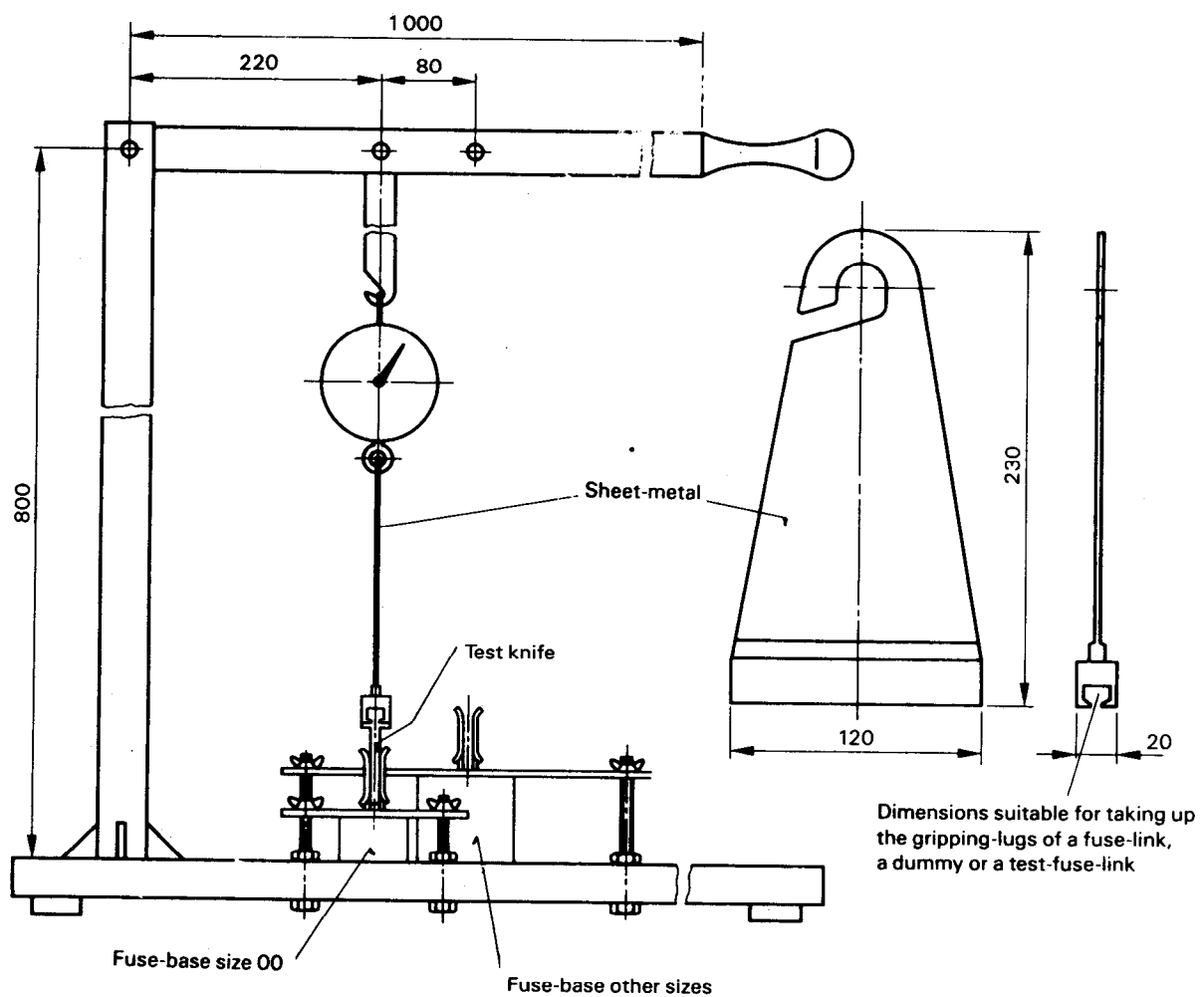
FIG. 6(I). — Measuring points according to Sub-clause 8.3.4 of IEC Publication 269-1 and Sub-clauses 8.3.4.1 and 8.3.4.2.

Dimensions in millimetres



For *b*, see Figure 1(I) continued

FIG. 7(I). — Test knife according to Sub-clause 8.5.5.1.2.



Dimensions in millimetres

FIG. 8(I). — Example of a measuring device for determining the withdrawal forces according to Sub-clauses 8.9.1 and 8.11.1.2.

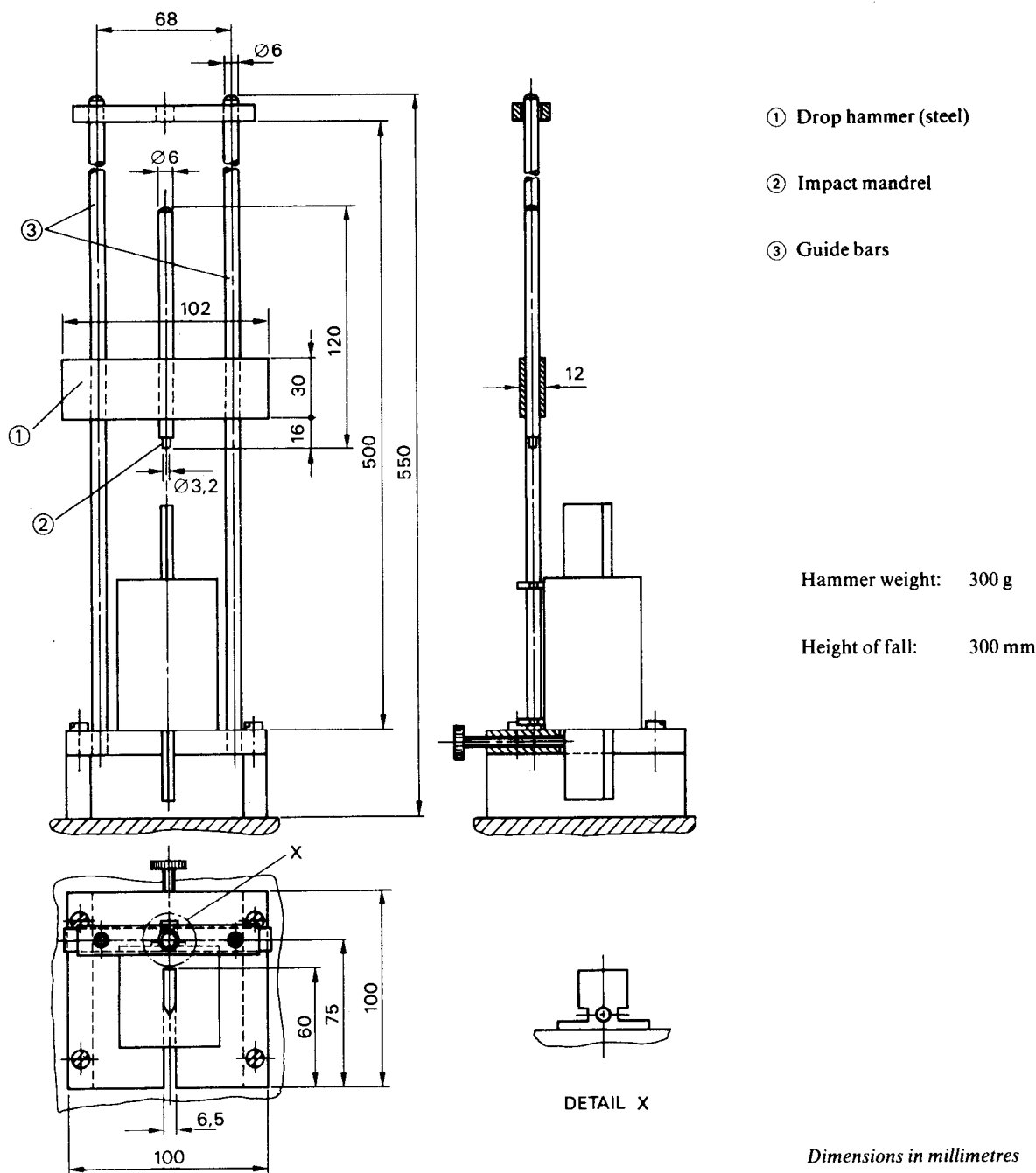


FIG. 9(I). — Facility for verifying the mechanical strength of gripping lugs (see Sub-clause 8.11.1.8).

SECTION II: FUSES WITH FUSE-LINKS FOR BOLTED CONNECTIONS

1.1 Scope

The following additional requirements apply to fuses with fuse-links having bolted connections. Such fuses have rated currents up to and including 1 250 A and rated voltages up to and including 660 V a.c. and up to and including 500 V d.c.

5.3.1 Rated current of the fuse-link

The maximum preferred rated currents are given in Figures 1(II*) and 1a(II*), pages 44 and 46.

5.3.2 Rated current of the fuse-holder

The maximum preferred rated currents for the fuse-holder are given in Figure 2(II), page 47.

5.5 Rated power dissipation of a fuse-link and rated power acceptance of a fuse-holder

The maximum values of power dissipation of fuse-links are given in Figure 1(II).

The maximum values of rated power acceptance of fuse-holders are given in Figure 2(II).

5.6 Limits of time-current characteristics

5.6.1 Time-current characteristics, time-current zones and overload curves

In addition to the limits of pre-arcing time given by the gates and the conventional times and currents, the time-current zones, excluding manufacturing tolerances, are given in Figures 3(II) and 4(II), pages 49 and 50. The tolerance on time-current characteristics shall not deviate by more than $\pm 10\%$ in terms of current.

5.6.2 Conventional times and currents

The conventional times and currents, in addition to the values of IEC Publication 269-1 are given in Table II.

TABLE II
Conventional time and current for "gG" fuse-links

Rated current I_n (A)	Conventional time (h)	Conventional current	
		I_{nf}	I_f
$I_n < 16$	1	$1.25 I_n$	$1.6 I_n$

5.6.3 Gates

For "gG" fuse-links the gates given in Table III and in IEC Publication 269-1 apply.

* Refers to Section II.

TABLE III
Gates for specified pre-arcing and operating times of "gG" fuse-links

I_n (A)	I_{min} (10 s) (A)	I_{max} (5 s) (A)	I_{min} (0.1 s) (A)	I_{max} (0.1 s) (A)
2	3.4	5.0	4.6	7.5
4	6.5	10.5	10.0	18.5
6	10.0	18.0	17.0	35.0
10	18.0	36.0	35.0	60.0

5.7.2 *Rated breaking capacity*

The rated breaking capacity shall be 80 kA a.c. and 40 kA d.c.

7.1 *Mechanical design*

The dimensions of fuse-links and fuse-bases are given in Figures 1(II) and 2(II), pages 44 and 47.

7.1.2 *Connections including terminals*

Under consideration.

7.9 *Protection against electric shock*

Where standardized fuse-holders according to Figure 2(II) are used the degree of protection against electric shock shall be at least IP-2X for all three stages.

8.3 *Verification of temperature rise and power dissipation*

8.3.1 *Arrangement of the fuse*

The test arrangement for fuse-links is given in Figure 5(II), page 51. The test arrangement shall be mounted vertically.

8.3.3 *Measurement of the power dissipation of the fuse-link*

The points of measurement of power loss are given in Figure 5(II).

8.4 *Verification of operation*

8.4.1 *Arrangement of the fuse*

The test arrangement of the fuse-link is given in Figure 5(II). The test arrangement shall be mounted vertically.

8.5 *Verification of breaking capacity*

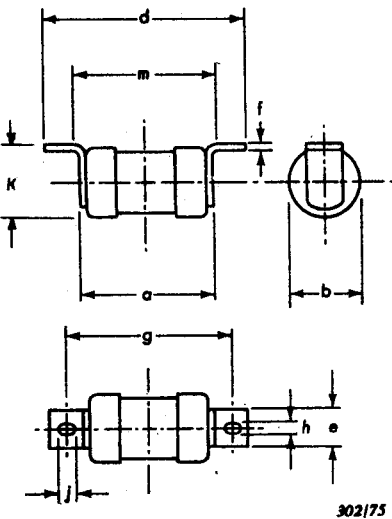
8.5.1 *Arrangement of the fuse*

The test arrangement of the fuse-link is given in Figure 6(II), page 52.

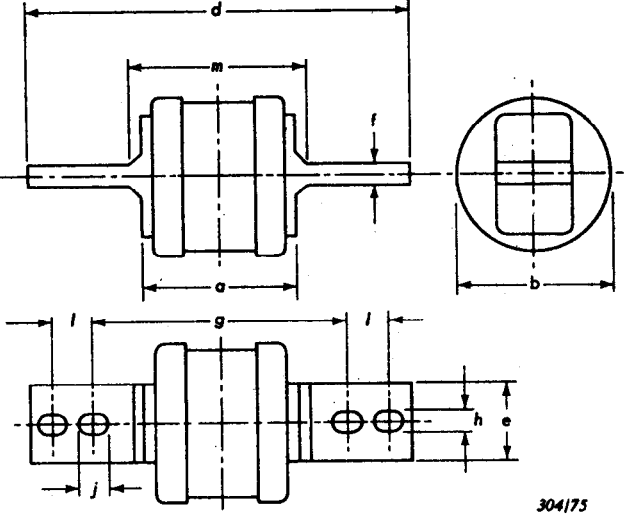
8.5.8 *Acceptability of test results*

The requirements of IEC Publication 269-1 apply and in addition fuse-links shall operate without the melting of the fine fuse wire and without mechanical damage to the rig.

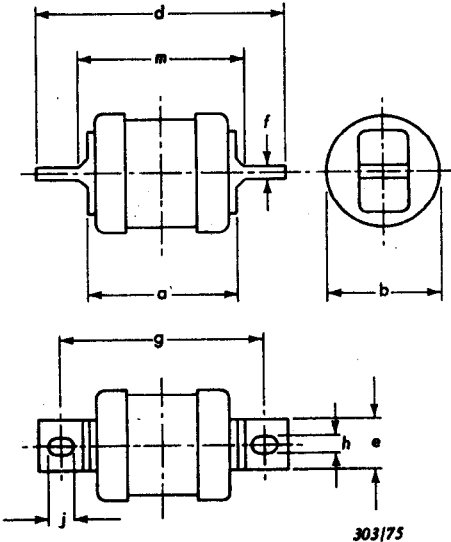
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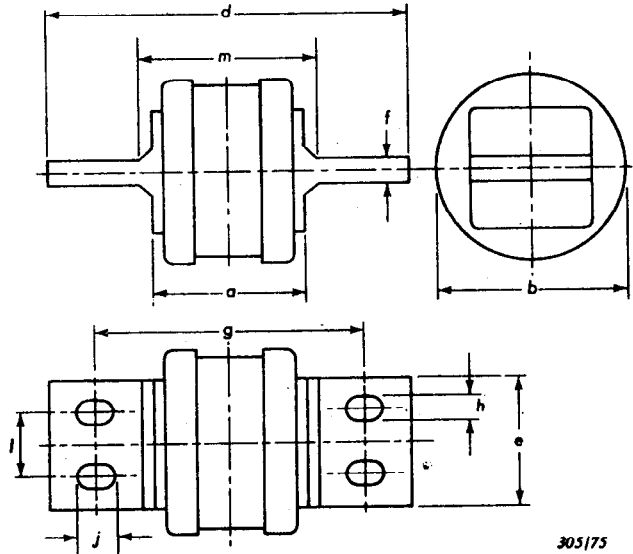
Reference A fuse-link



Reference C fuse-link



Reference B fuse-link



Reference D fuse-link

The drawings are not intended to govern the design of fuse-links except as regards the notes and dimensions shown.

FIG. 1(II*). — Fuse-links for bolted connection — References A, B, C and D. (Figure continued)

* Refers to Section III.

Dimensions in millimetres

Reference	Maximum rated current (A)	Maximum power dissipation (W)	<i>a</i> (max.) (1)(2)	<i>b</i> (max.)	<i>d</i> (max.)	<i>e</i> (max.) (3)	<i>f</i> (min.) (max.) (3)	<i>g</i> (nom.)	<i>h</i> (nom.)	<i>j</i> (min.) (2)(4)	<i>k</i> (max.)	<i>l</i> (nom.)	<i>m</i> (max.) (1)
A1	20	3	36,5	14,5	56	11,2	0,8 1,5	44,5	4,2	5,5	14,5	—	36,5
A2	32	4,75	57	24	86	9,2	0,8 1,5	73	5,5	7	25,5	—	60
A3	63	7,75	58	27	91	13	1,2 1,6	73	5,5	7	28	—	61
A4	100	10,5	70	37	111	20	2,4 3,2	94	8,7	9,5	38,5	—	74
B1	100	10,5	70	37	138	20	3,2 4	111	8,7	11	—	—	82
B2	200	22	77	42	138	20	3,2 4	111	8,7	11	—	—	82
B3	315	32	77	61	138	26	3,2 4,8	111	8,7	11	—	—	82
B4	400	40	83	66	138	26	4,8 6,6	111	8,7	11	—	—	89
C1	400	40	83	66	212	26	4,8 6,6	133	10,3	11	—	25,4	95
C2	630	55	85	77	212	26	6,3 7,8	133	10,3	11	—	25,4	95
C3	800	70	89	84	212	39	9,5 11,1	133	10,3	12,5	—	25,4	101
D1	1 250	100	89	102	200	64	9,5 12,7	149	14,3	16,5	—	31,8	95

Notes:

- (1) In all references, dimension *a* includes any projections such as rivet heads, but the design of the tags between dimensions *a* and *m* is limited by a line drawn at 45° to the contact surface.
- (2) All fixing holes are elongated as indicated by *j* to allow for manufacturing tolerances on dimension *a*.
- (3) Dimensions *e* and *f* are nominal material sizes and subject to manufacturing tolerances as specified in the relevant standards for the raw materials.
- (4) For A1 to A4 reference fuse-links, the fixing slots may be extended either axially or laterally to form open-ended slots.

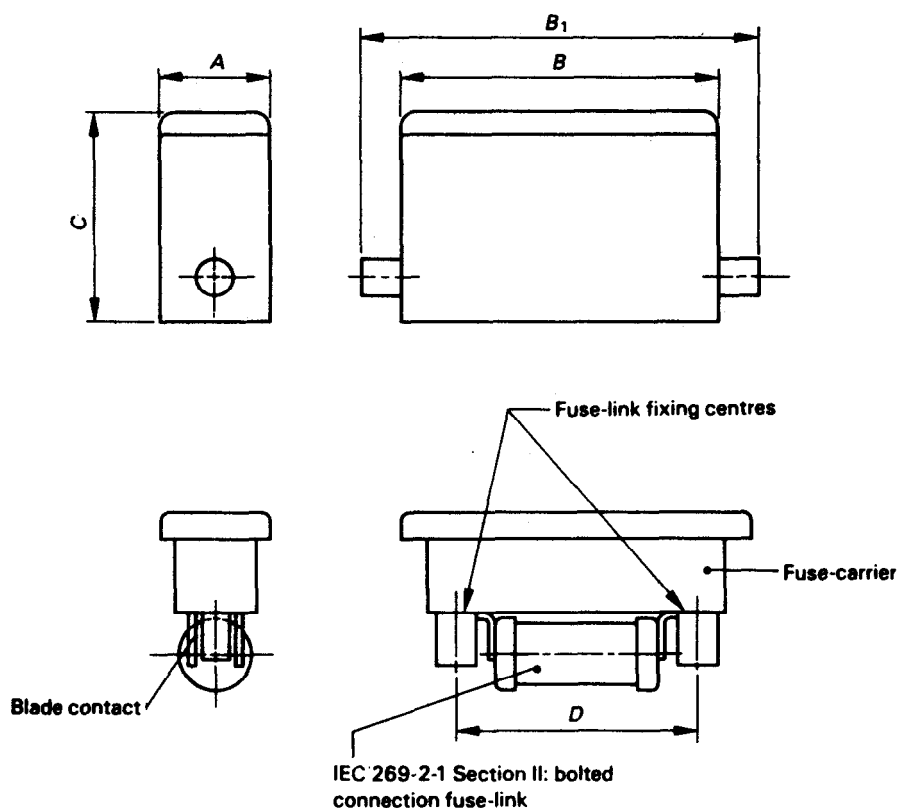
FIG. 1 (Concluded)

Standardized "gM" fuse-links

Dimensional reference	Standardized ratings	Current rating (A)	Characteristic rating (A)
A1 A1	20M25 20M32	20 20	25 32
A2 A2 A2	32M40 32M50 32M63	32 32 32	40 50 63
A3 A3	63M80 63M100	63 63	80 100
A4 } B1 A4 } et/and B1 A4 } B1	100M125 100M160 100M200	100 100 100	125 160 200
B2 B2	200M250 200M315	200 200	250 315

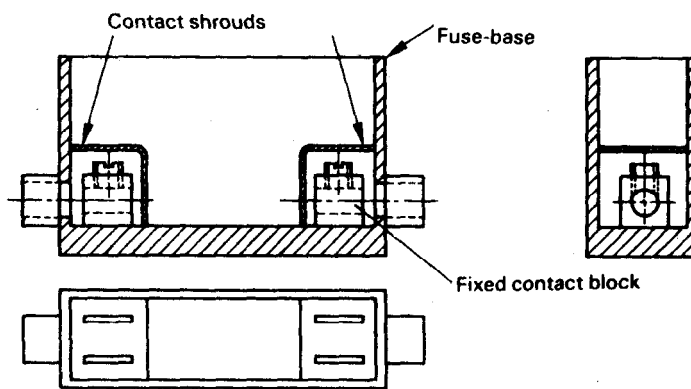
The power dissipation of "gM" fuse-links are lower than the values given for "gG" fuse-links in the same dimensional references.

FIG. 1a(II). — Fuse-links for bolted connection — References A and B.



Note. — The fuse-carrier may accommodate centre tag or offset tag fuse-links.

FIG. 2(II). — Typical fuse-holder. (*Figure continued*)



Note. — Apertures in shrouds to give a degree of protection of IP 2X (IEC 529).

Maximum rated current (A)	Maximum rated power acceptance (W)	A max.	B max.	B ₁ max.	C max.	D	Fuse-link accommodated, reference
20	2,7	30	91	110	62	44,5	A1
32	4,4	35	114	134	75	73	A2
63	6,9	47	140	140	91	73	A3
100	9,1	61	175	175	121	94	A4
200	17,0	86	233	310	159	111	B1 + B2

Dimensions in millimetres

This drawing is included by way of illustration only and does not prejudice the use of other shapes or forms provided they fall within the dimensions listed above.

FIGURE 2(II). — *(Concluded)*

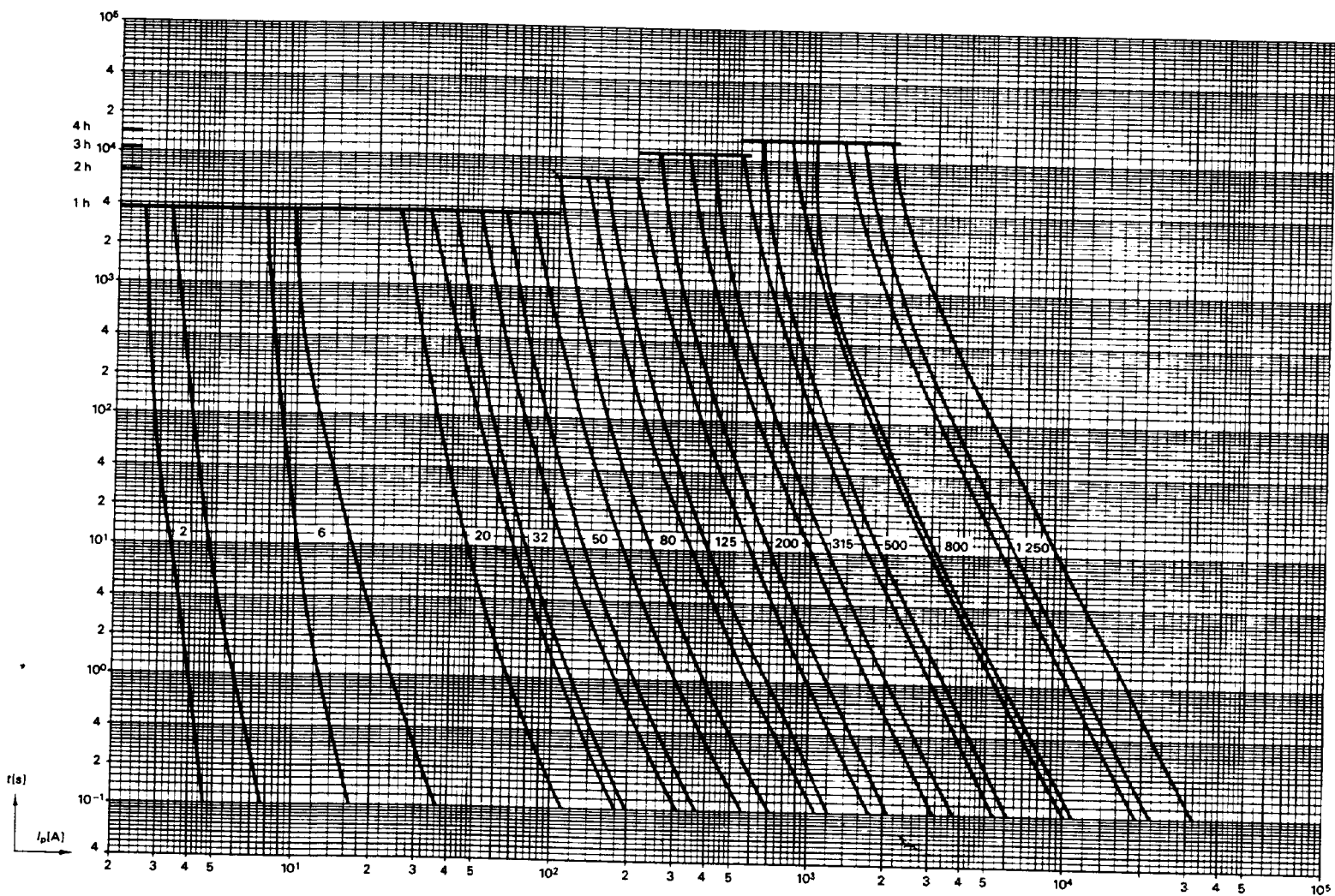


FIG. 3(II). — Time-current zones for "gG" fuse-link.

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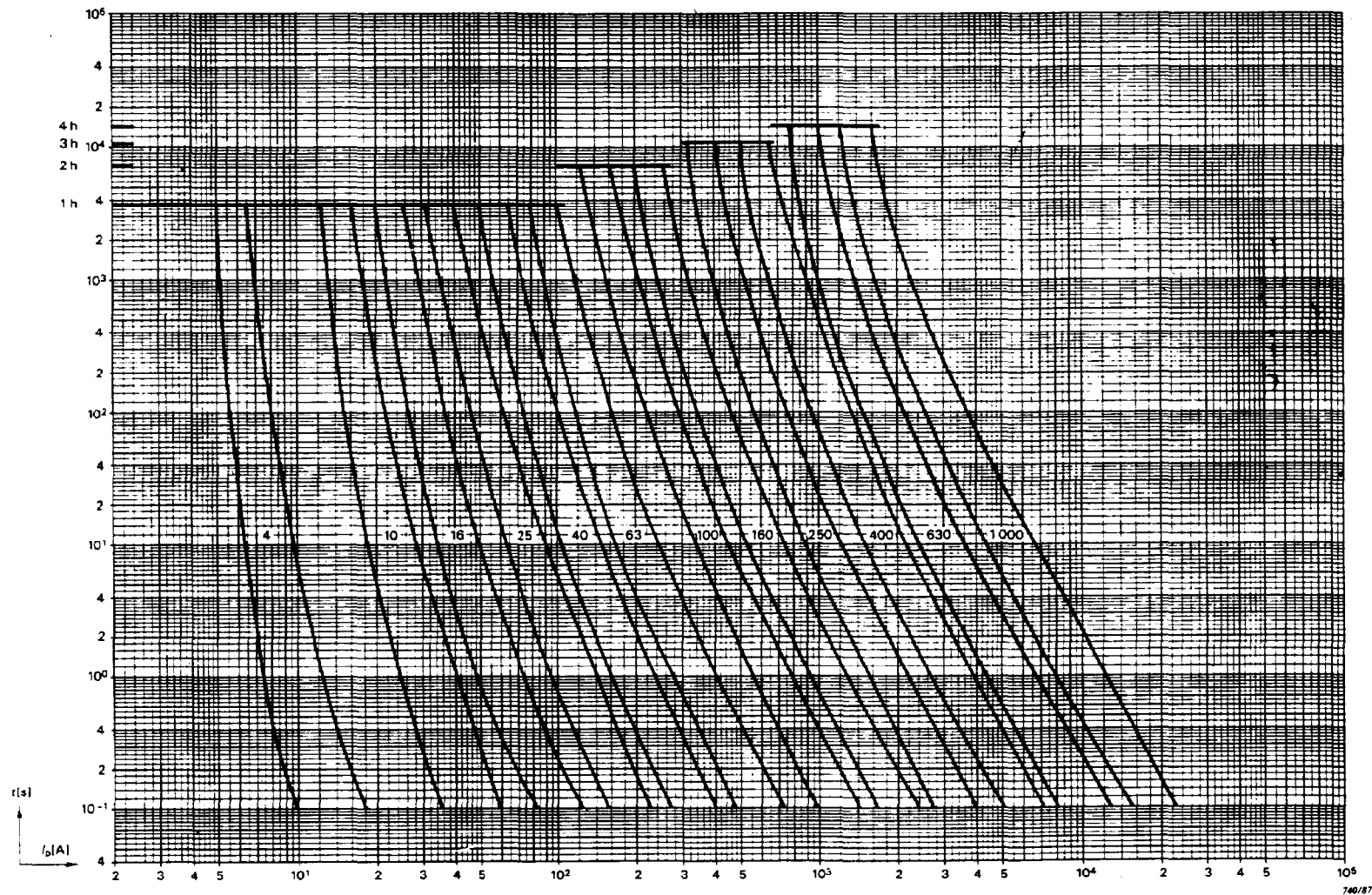
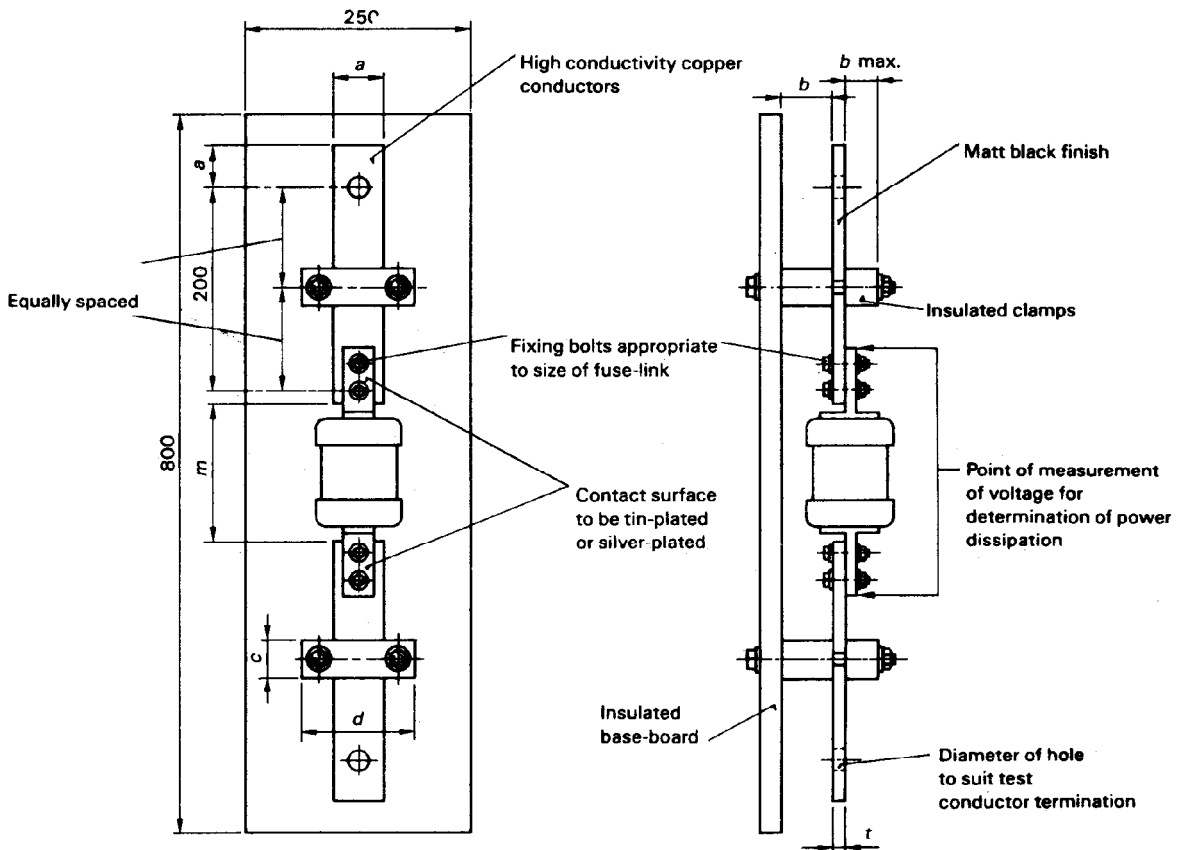


FIG. 4(II). — Time-current zones for "gG" fuse-link.

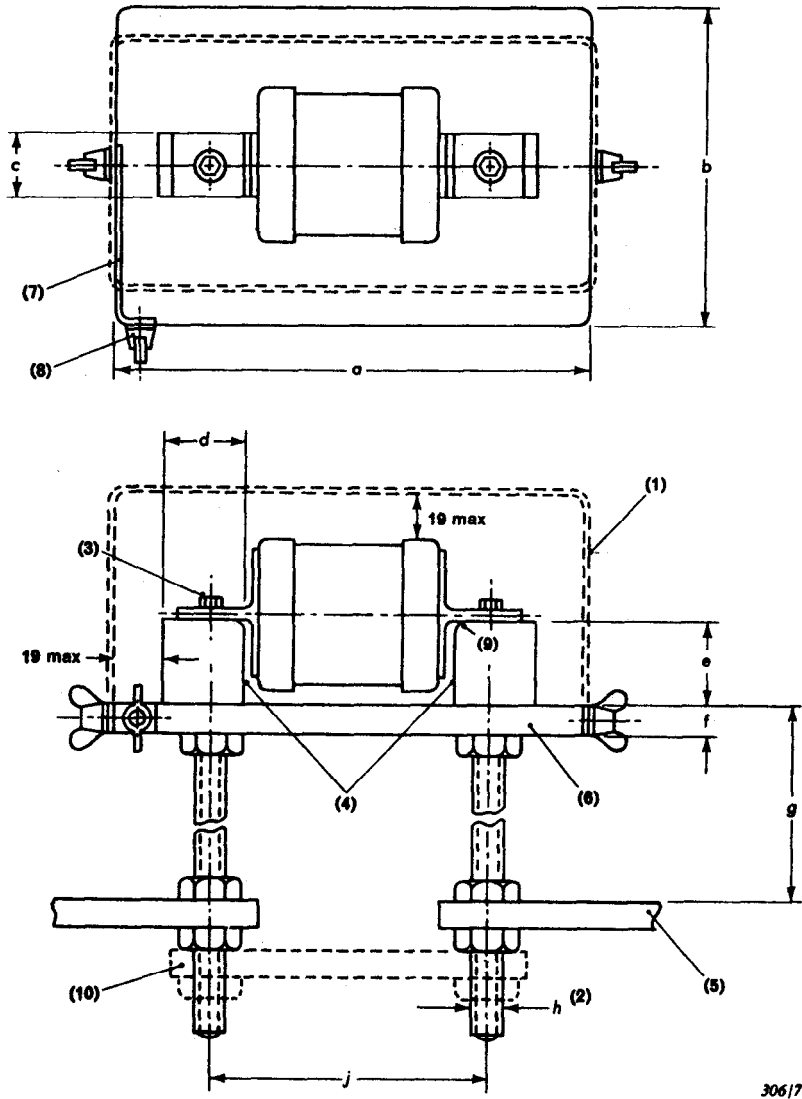


Note. — Approximate dimensions are acceptable.

Fuse-link, reference	Dimensions						Current rating in A up to
	<i>a</i>	<i>b</i>	<i>c</i>	<i>d</i>	<i>m</i>	<i>t</i>	
A1	10	12,5	16	50	38	0,5	20
A2	10	12,5	16	50	61	0,5	32
A3	16	12,5	16	50	62	1,0	63
A4	20	25	25	70	75	1,6	100
B1	20	25	25	70	83	1,6	100
B2	20	25	25	70	83	5	200
B3	25	38	25	80	83	8	315
B4	25	38	25	80	90	10	400
C1	25	38	25	80	96	10	400
C2	32	38	25	80	96	12	530
C3	40	45	32	100	101	12	800
D1	80	60	45	160	96	10	1 250

Dimensions in millimetres

FIG. 5(II). — Power dissipation test rig.



Dimensions in millimetres

Fuse-link, reference	Current rating up to	Dimensions								
		a	b	c	d	e	f	g	h	j
B1 à/to B4	A 400	187	127	25	36,5	38	12	114	M12	111
C1 à/to C3	800	248	140	38	51	50	20	114	M20	159
D1	1 250	305	152	63	83	57	20	114	M24	159

FIG. 6(II). — Breaking capacity test rig for fuse-links for bolted connection. (Figure continued)

Notes:

- (1) Detachable cover fabricated from woven wire cloth, mild steel sheet or perforated mild steel sheet of such thickness as to ensure reasonable rigidity. Individual apertures in the wire cloth or perforated steel sheet shall not exceed 8.5 mm^2 in area. The cover may differ in section from that shown on the drawings provided that the clearance of 19 mm between the cover and live metal parts is not exceeded.
- (2) Connecting studs of high conductivity copper.
- (3) Fixing centres; for A1 to A3 fuse-links, suitable adapters of minimum section $25 \text{ mm} \times 6.3 \text{ mm}$ shall be used.
- (4) A visible gap at this position is essential to ensure that the end caps are not supported by the contact blocks.
- (5) The arrangement of the test connections beyond the test rig is not specified (the second paragraph of Sub-clause 8.5.1 of IEC Publication 269-1 does not apply).

The size of the copper conductors shall be selected according to the rated breaking capacity.

- (6) The base shall be made from phenolic resin bonded laminated sheet having a cross-breaking strength of not less than 85 MPa.
- (7) Copper strip
- (8) Terminal for fine fuse-wire.
- (9) Chamfer.
- (10) Short-circuiting link required for prospective current test. This may be slotted for easy disconnection.

The size of the copper link shall be selected according to the rated breaking capacity.

FIGURE 6(II). — (Concluded)

SECTION III: FUSES WITH FUSE-LINKS HAVING CYLINDRICAL
CONTACT CAPS

1.1 Scope

The following supplementary requirements apply to fuses with fuse-links having cylindrical caps, complying with the dimensions indicated in Figures 1(III) and 2(III), pages 60 and 61, for rated currents not exceeding 125 A and for rated voltages up to and including 660 V a.c.

5.2 Rated voltage

For a.c. the standard values of rated voltages are 400 V, 500 V or 660 V.

5.3.1 Rated current of the fuse-link

The maximum rated currents of the fuse-link are given in Table K.

TABLE K
Maximum rated current of fuse-links with cylindrical caps

Size	500 V a.c.		660 V a.c.	
	gG	aM	gG	aM
	I_n (A)	I_n (A)	I_n (A)	I_n (A)
10 × 38	25	16	10	
14 × 51	50	40**	25	25
22 × 58	100*	100*	50	50

* 125 A for a voltage of 400 V a.c.

** 50 A for a voltage of 400 V a.c.

5.3.2 Rated current of the fuse-holder

The maximum rated currents of the fuse-holder are given in Table L.

TABLE L
Rated current of fuse-holders

Size	500 V a.c. and 660 V a.c.
	I_n (A)
10 × 38	25
14 × 51	50
22 × 58	100*

* 125 A if a fuse-link of 400 V is used.

5.5 Rated power dissipation of a fuse-link and rated power acceptance of a fuse-holder

The maximum rated values of power dissipation of fuse-links are specified in Table M. They apply for a rated voltage of 500 V a.c. The values for 660 V a.c. are under consideration.

TABLE M

*Maximum rated power dissipation of a fuse-link,
expressed in watts*

Size	10 × 38	14 × 51	22 × 58
gG	3	5	9.5
aM	1.2	3	7

The maximum rated values of power acceptance of fuse-bases are given in Table N.

TABLE N

*Maximum rated power acceptance of a
fuse-holder of rated voltage of 500 V a.c. and
660 V a.c., expressed in watts*

Size	10 × 38	14 × 51	22 × 58
Power acceptance	3	5	9.5

5.6 See Section I, Sub-clause 5.6

6. See Section I, Clause 6

7.1 Mechanical design

The dimensions of fuse-links and fuse-bases are given in Figures 1(III) and 2(III), pages 60 and 61.

7.1.2 Connections including terminals

The terminals are to be capable of accepting the following cross-sections in Table P.

TABLE P

Minimum range of cross-sections for rigid copper conductors

Size	10 × 38	14 × 51	22 × 58
Cross-section (mm ²)	1.5 to 6	2.5 to 16	4 to 50

7.7 See Section I, Sub-clause 7.7

7.8 See Section I, Sub-clause 7.8

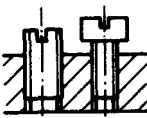
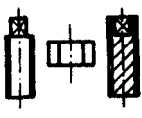
7.9 See Section I, Sub-clause 7.9

8.1.6 See Section I, Sub-clause 8.1.6

8.3.1 Arrangement of the fuse

The screws of the terminals are to be fastened by applying a torque which is given in Table Q.

TABLE Q

Nominal diameter of thread (mm)	Torque (Nm)				
	I	II	III	IV	V
					
Up to and including 2.8	0.2	—	0.4	0.4	—
Over 2.8 up to and including 3.0	0.25	—	0.5	0.5	—
Over 3.0 up to and including 3.2	0.3	—	0.6	0.6	—
Over 3.2 up to and including 3.6	0.4	—	0.8	0.8	—
Over 3.6 up to and including 4.1	0.7	1.2	1.2	1.2	1.2
Over 4.1 up to and including 4.7	0.8	1.2	1.8	1.8	1.8
Over 4.7 up to and including 5.3	0.8	1.4	2.0	2.0	2.0
Over 5.3 up to and including 6.0	1.2	1.8	2.5	3.0	3.0
Over 6.0 up to and including 8.0	2.5	2.5	3.5	6.0	4.0
Over 8.0 up to and including 10.0	—	3.5	4.0	10.0	6.0
Over 10.0 up to and including 12.0	—	4.0	—	—	8.0
Over 12.0 up to and including 15.0	—	5.0	—	—	10.0

The conductor is moved each time the screw or nut is loosened.

Column I applies to screws without heads if the screw when tightened does not protrude from the hole, and to other screws which cannot be tightened by means of a screwdriver with a blade wider than the diameter of the screw.

Column II applies to nuts of mantle terminals which are tightened by means of a screwdriver.

Column III applies to other screws which are tightened by means of a screwdriver.

Column IV applies to screws and nuts other than nuts of mantle terminals, which are tightened by means other than a screwdriver.

Column V applies to nuts of mantle terminals which are tightened by means other than a screwdriver.

8.3.4.1 *Temperature-rise of the fuse-holder*

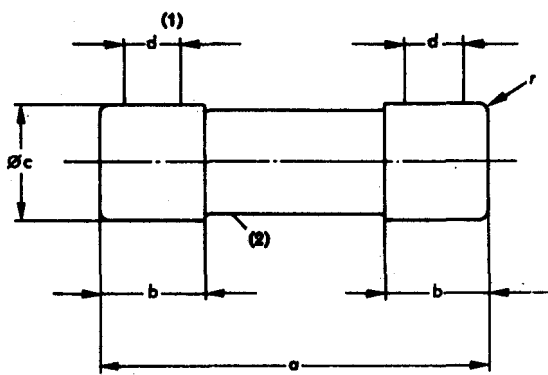
The dummy fuse shall have the dimensions indicated in Figure 1(III), page 60, and have the maximum power dissipation indicated in Table N.

8.3.4.2 *See Section I, Sub-clause 8.3.4.2*

8.7.4 *See Section I, Sub-clause 8.7.4*

Table H of Section I is applicable up to the rated current of 125 A.

Dimensions in millimetres



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The drawing is not intended to govern the design of fuse-links except as regards the notes and the dimensions shown.

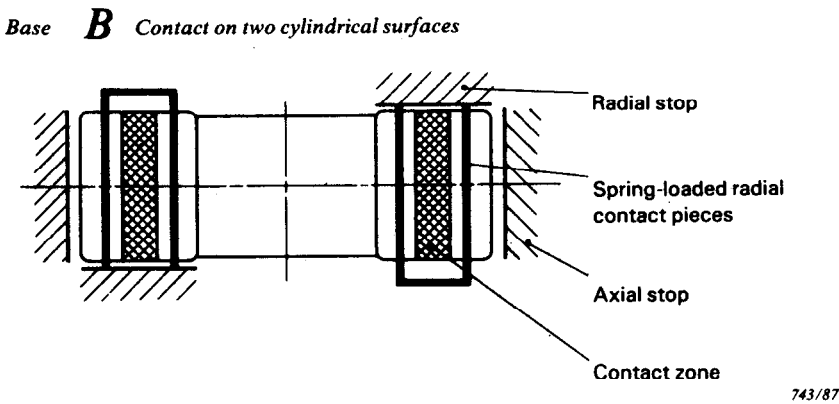
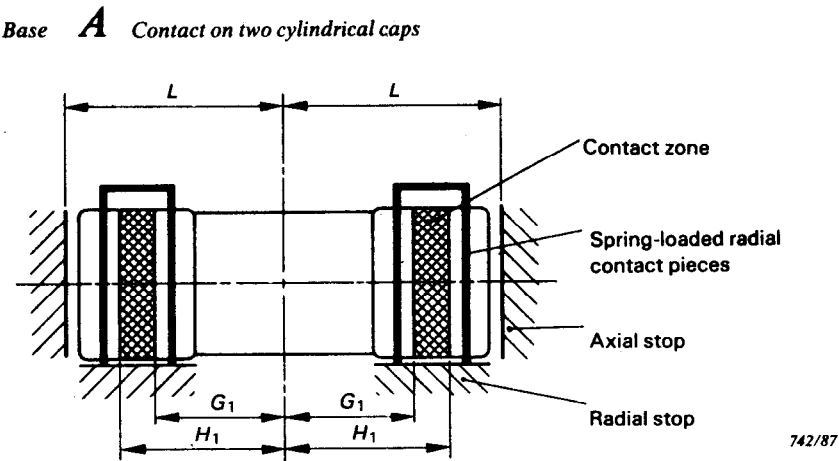
Size	Power dissipation (3) (W)	a	b (max.)	c	d (min.)	r
10 × 38	3	38 ± 0,6	10,5	10,3 ± 0,1	6	1,5 ± 0,5
14 × 51	5	51 ^{+0,6} ₋₁	13,8	14,3 ± 0,1	7,5	2 ± 1
22 × 58	9,5	58 ^{+0,1} ₋₂	16,2	22,2 ± 0,1	11	2 ± 1

Notes:

- (1) Cylindrical part within which the specified tolerances shall not be exceeded.
- (2) The diameter of the cartridge between the end caps shall not exceed diameter c.
- (3) The power dissipation represents the maximum power dissipation of the fuse-link and at the same time the minimum power acceptance to be tolerated by the fuse-base or fuse-holder.

FIG. 1(III*). — Fuse-links with cylindrical caps.

* Refers to Section III.

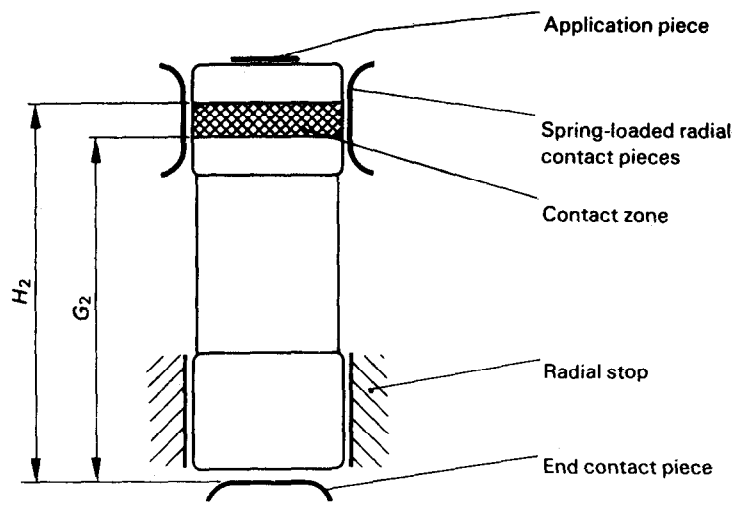


Size	I_n (A)	G_1 max.	H_1 min.	L +0,8
10 × 38	25	13	15,5	19,3
14 × 51	50	18	20,5	25,8
22 × 58	100	18	25	29

Dimensions in millimetres

FIG. 2(III). — Base for fuse-links with cylindrical caps. (Figure continued).

Base C One contact on a cylindrical surface, the other contact on an end surface



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Size	I_n (A)	G_2 max.	H_2 min.
10 × 38	25	31,5	34,5
14 × 51	50	43	47
22 × 56	100	46	52

Dimensions in millimetres

The drawings are not intended to govern the design of fuse-links except as regards the notes and dimensions shown.

Notes on the drawings

- (1) The contacts shall be made within the contact zones shown on the fuse-links. For sizes 14 × 51 and 22 × 58, the contact forces shall be provided by an external spring (for sizes 10 × 38, the elasticity of the contact pieces themselves is sufficient). The elastic properties and coating of the contact pieces shall remain stable when subjected to the thermal and mechanical stresses to be reasonable expected in practice.
 - (2) Axial stops, application pieces and contact pieces shall be so constructed as not to interfere with the operation of any indicating devices or strikers which may be incorporated in the fuse-link.
 - (3) At least one of the contact pieces, or in the case of base C, the application piece, shall be sufficiently elastic (with external springs for sizes 14 × 51 and 22 × 58) in the direction of the arrow, taking into account the axial tolerances of the dimensions of the fuse-links.
 - (4) Contact shall be ensured in the zones provided by means of radial stops situated in the vicinity of the contact pieces of the fuse-link.
- Indicate the direction in which the fuse-link is withdrawn.

FIGURE 2(III). — (Concluded)

NATIONAL ANNEX

Clause
7.1.2 (Table D)

Remarks

For the purposes of Indian Standard, terminals shall be so designed as to be suitable for aluminium conductors.

Section IV

For the purposes of Indian Standard, fuses of compact dimensions primarily intended for use in 240/415 V ac commercial installations are also considered standard.

SECTION IV FUSES WITH COMPACT DIMENSIONS

1 SCOPE

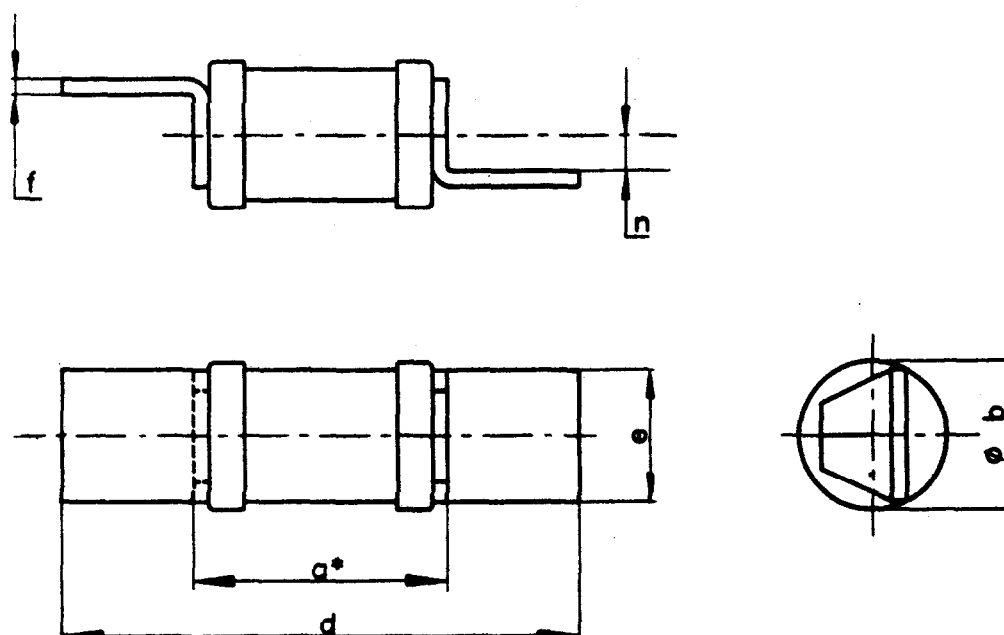
The following supplementary requirements apply to fuses of compact dimensions primarily intended for use in 240/415 V ac industrial and commercial installations.

2 TIME CURRENT ZONES

The standard zones for time-current characteristics based on ambient air temperature of 20°C and at rated voltage are as given in Fig. 1 (IV), 2 (IV), 3 (IV) and 4 (IV).

3 DIMENSIONS

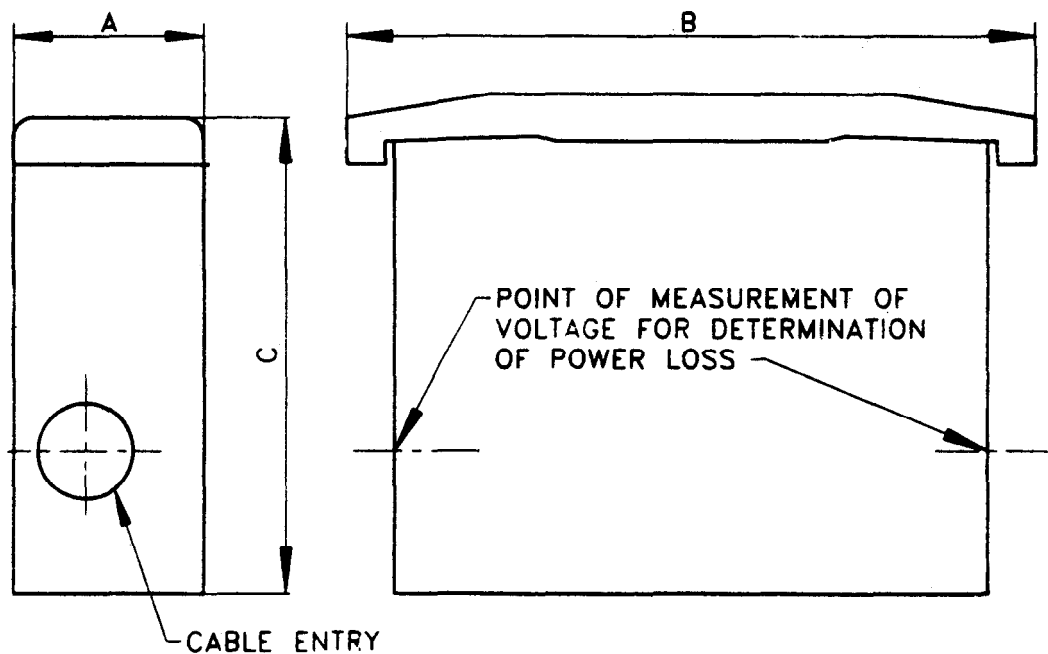
3.1 Dimensions for fuse links are given in Fig. 5 (IV). E1 fuse-links are rated at 240 V and F1, F2 fuse units are rated at 415 V



Fuse Link	Max Pref Current Rating <i>A</i>	Max Power Dissipation <i>W</i>	Dimensions (mm)									
			^a <i>a</i> Max	<i>b</i> Max	<i>d</i> Max	Min	<i>e</i> Max	Min	<i>f</i> Max	Min	<i>n</i> Max	Min
E1	20	1.8	25	14.5	51	47	13	11	1.5	0.8	3.8	3.2
F1	32	3.2	35.5	14.5	62	58	13	11	1.5	0.8	3.8	3.2
F2	63	4.8	39	17.5	69	65	15.5	14.5	1.6	1.2	3.8	3.2

*Dimension 'a' may be up to 0.5 mm more than the stated value to allow for projecting rivet heads at the centres of tag faces.

FIG. 1 COMPACT FUSE-LINK DIMENSIONS



Fuse Link	Rated Current <i>A</i>	Minimum Power Acceptance <i>W</i>	Dimensions (mm)		
			<i>A</i> <i>Max</i>	<i>B</i> <i>Max</i>	<i>C</i> <i>Max</i>
E1	20	2	26	71	59
F1	32	3.5	26	81	59
F2	63	5	32	96	68

The above illustration does not prejudice the use of other shapes or forms provided they fall within the maximum dimensions listed.

FIG. 2 FRONT CONNECTED FUSE HOLDERS FOR COMPACT FUSE-LINKS

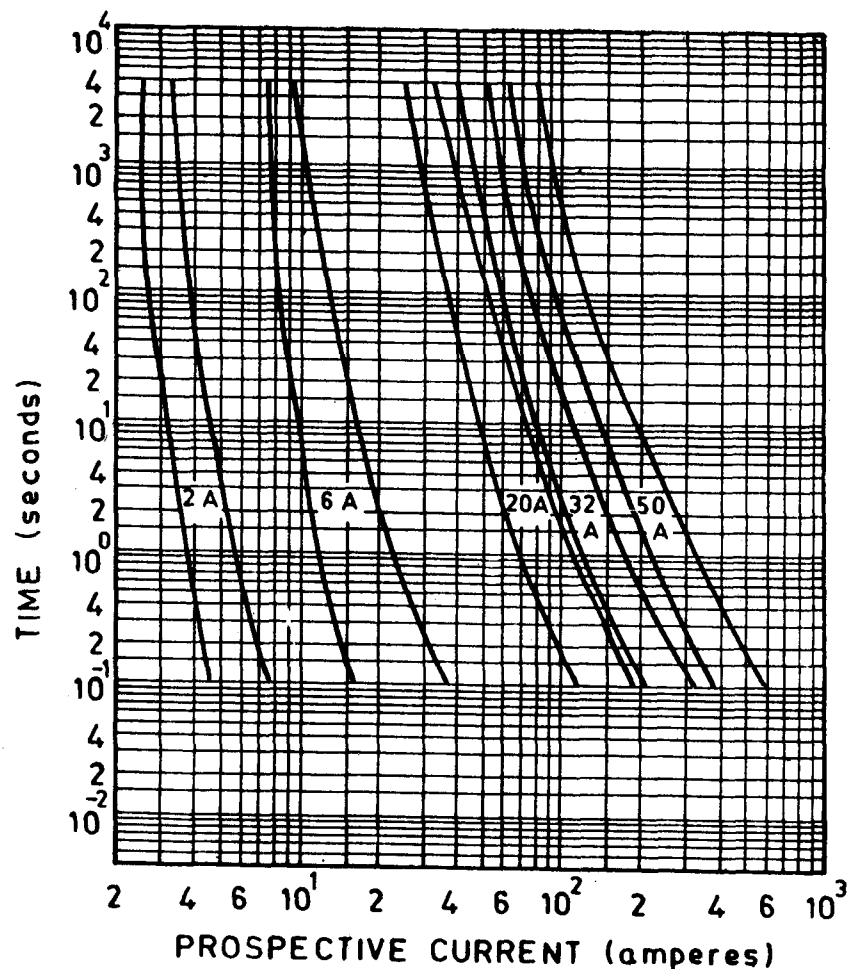
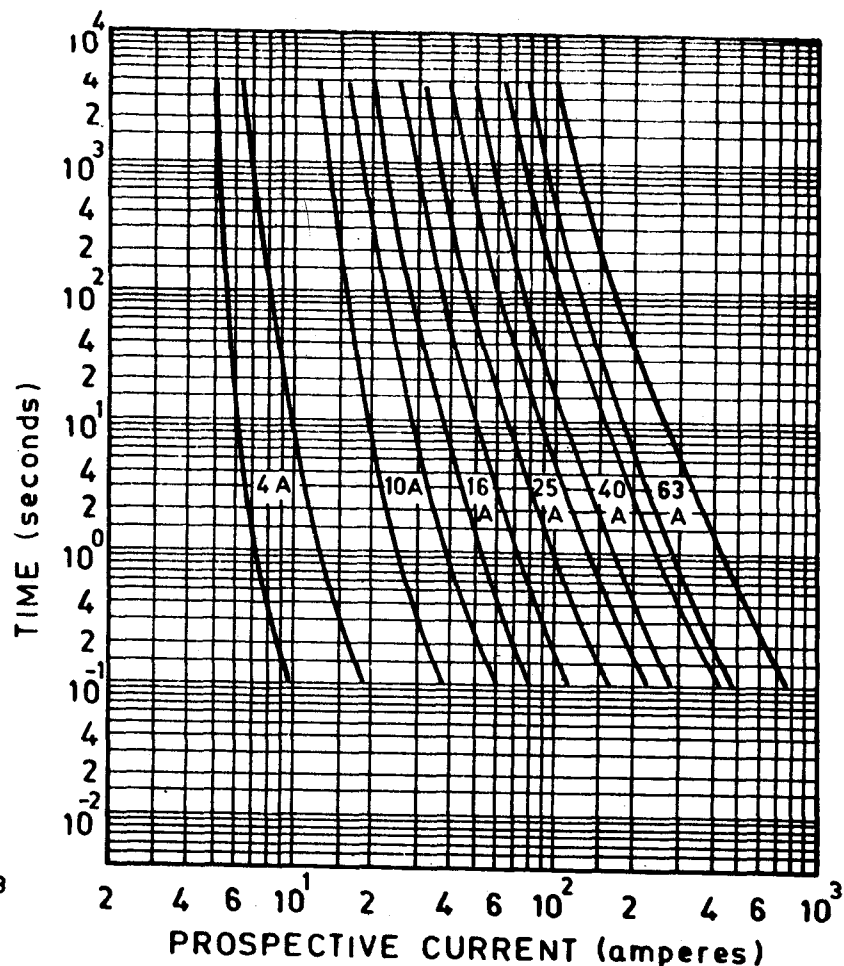
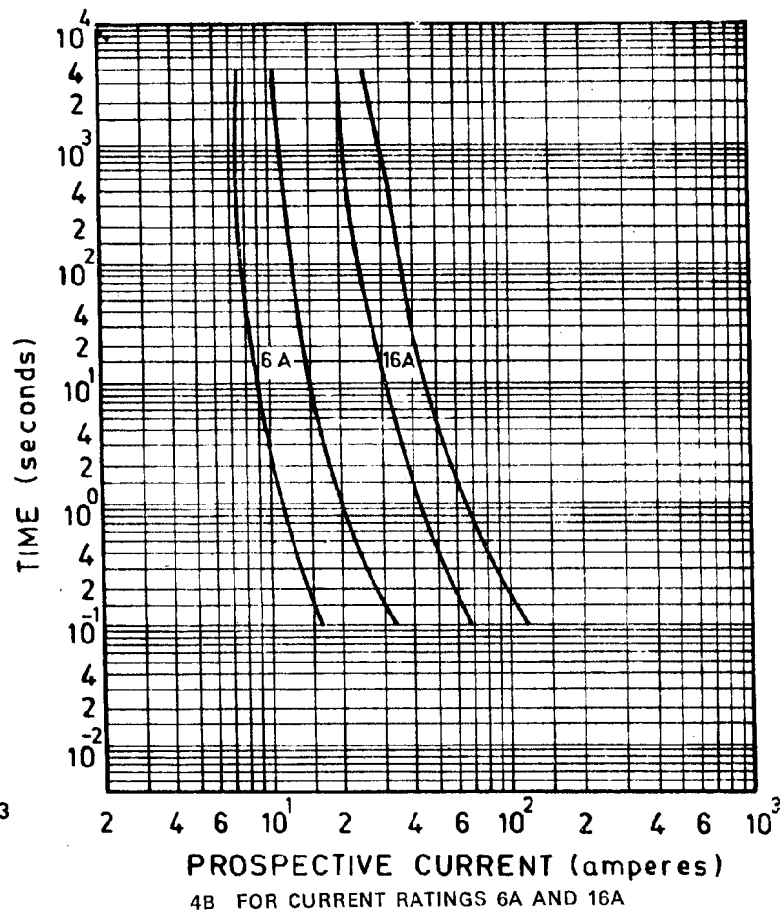
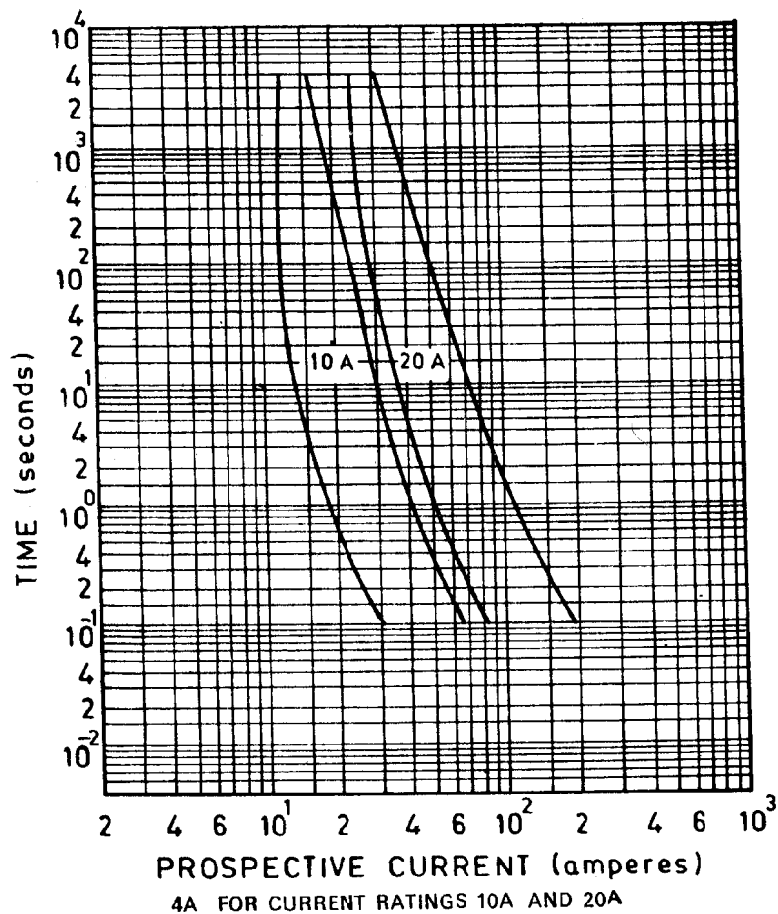
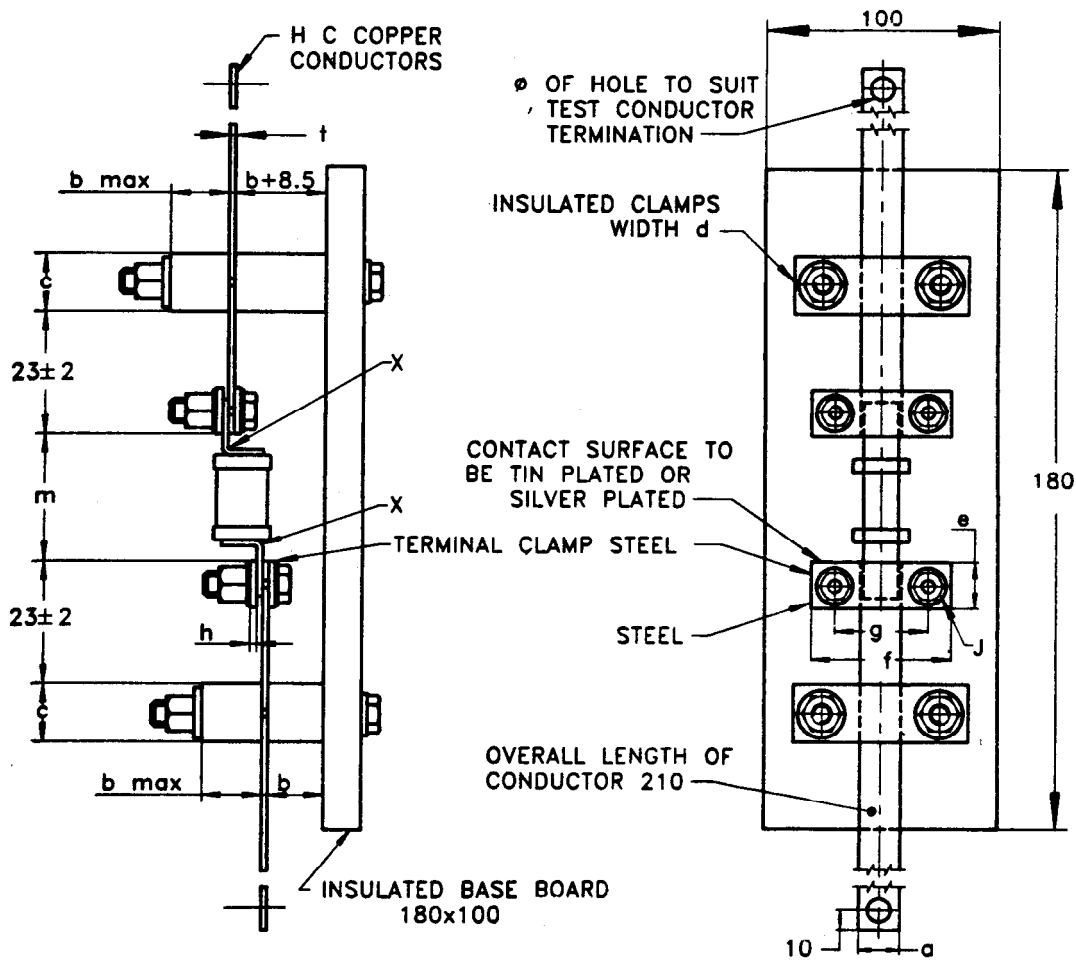


FIG. 3 TIME/CURRENT ZONES FOR F_1 AND F_2 FUSE-LINKS

FIG. 4 TIME/CURRENT ZONES FOR E_1 FUSE-LINKS



Fuse Link	a	b	c	d	e	f	g	h	j	m	t	Current Rating A
E1	10	12.5	16	50	12.5	40	28	1.6	M4	30	0.5	20
F1	10	12.5	16	50	12.5	40	28	1.6	M4	40	0.5	32
F2	16	12.5	16	50	15	45	28	1.6	M5	45	1.0	63

All dimensions in millimetres.

FIG. 5 POWER DISSIPATION TEST RIG

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